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EPA Superfund
Record of Decision:

BURLINGTON NORTHERN LIVINGSTON SHOP COMPLEX
EPA ID: MTD986066025
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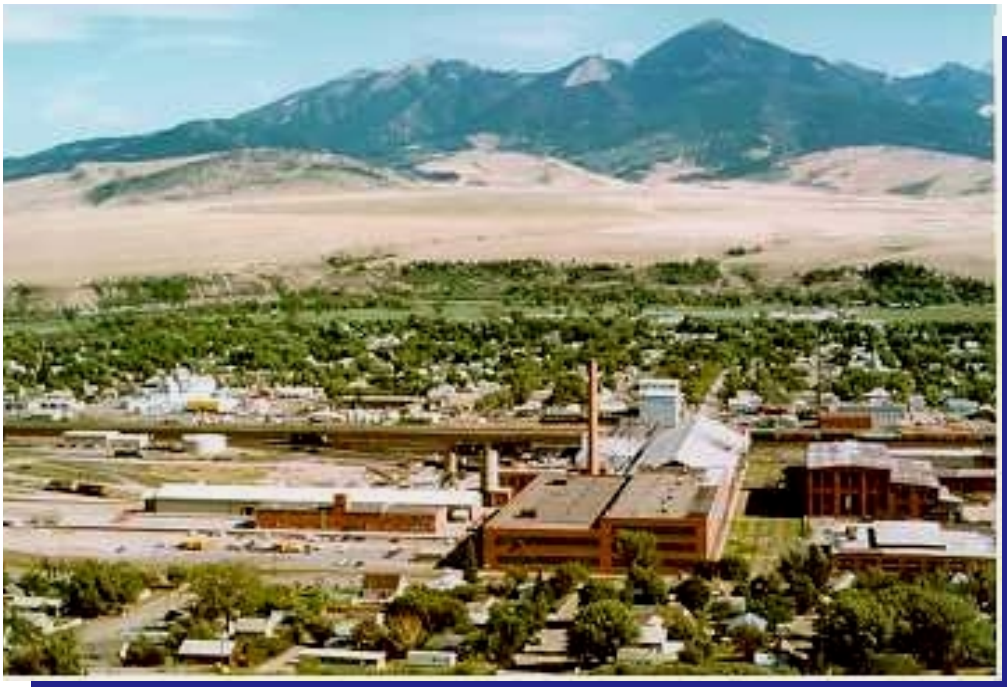
LIVINGSTON, MT
09/07/2001

Record of Decision

Burlington Northern
Livingston Shop Complex

Livingston, Montana



September 2001

Montana Department of
ENVIRONMENTAL QUALITY

Record of Decision
Burlington Northern Livingston Shop Complex
Livingston, Montana

INTRODUCTION

The Montana Department of Environmental Quality (DEQ) presents the Record of Decision (ROD) for the Burlington Northern (BN) Livingston Shop Complex. The BN Livingston Shop Complex is a maximum priority Comprehensive Environmental Cleanup and Responsibility Act (CECRA, also known as state Superfund) site. DEQ considered the remedial investigation and feasibility studies in selecting the remedy. The ROD is based on the Administrative Record, including: the remedial investigation (RI); two feasibility studies (FSs); the baseline risk assessment (BRA); the Proposed Plan; public comments received, including those from the potentially liable persons; and other related information. All of these documents are available for public review at the information repositories listed in Section III of the ROD. The ROD presents a brief review of the RI and FSs; actual and potential risks to human health and the environment; Environmental Requirements, Criteria and Limitations (ERCLs); and the selected remedy. This remedy is selected pursuant to CECRA, as amended in 1991. In addition, DEQ drew upon the Comprehensive Environmental, Response, Compensation and Liability Act (CERCLA), National Contingency Plan (NCP), and Environmental Protection Agency (EPA) guidance for direction in preparing the ROD and as otherwise appropriate. The ROD has three purposes:

- To certify that the remedy selection process is carried out in accordance with the requirements of CECRA, as amended in 1991, and to document that the remedy selection is consistent with the requirements of CERCLA and the NCP to the extent practicable, and to certify compliance with paragraph 7.A. of the Modified Partial Consent Decree, Order and Judgment entered in the United States District Court for the District of Montana in State of Montana ex rel. Department of Health and Environmental Sciences v. Burlington Northern, 88-141-H-CCL (April 27, 1990).

- To outline the remedial components and requirements of the selected remedy; and

- To provide the public with a consolidated source of information about the history, characteristics and risks posed by conditions at the BN Livingston Shop Complex, as well as a summary and evaluation of the cleanup alternatives considered, the rationale behind the selected remedy, and DEQ's responses to comments received on the Proposed Plan.

The ROD consists of three components:

1. The **Declaration** is a summary of key information contained in the ROD and is the section of the ROD signed by the Director of DEQ.

2. The **Decision Summary** provides an overview of the site characteristics, the alternatives considered and evaluated and the analysis of those options. The Decision Summary also identifies the selected remedy and explains how the remedy fulfills statutory requirements.

3. The **Response Summary** reiterates public comments received on the Proposed Plan, the FSs and other information in the Administrative Record and provides DEQ’s response to those comments.

DECLARATION

Declaration of Record of Decision

SITE NAME AND LOCATION

The BN Livingston Shop Complex is a maximum priority site on the Montana CECRA Priorities List.

STATEMENT OF PURPOSE

This decision document presents DEQ's selected remedial action for the BN Livingston Shop Complex in Livingston, Montana. This document is developed in accordance with CECRA, as amended in 1991, and is consistent with the requirements of CERCLA and the NCP to the extent practicable.

STATEMENT OF BASIS

The selected remedial action set forth in the ROD is based on the Administrative Record. The Administrative Record was developed in accordance with section 75-10-713 of CECRA and sections 113(k) and 117 of CERCLA and complies with the Modified Partial Consent Decree. The complete Administrative Record is available for public review at the information repository located at DEQ, Remediation Division, 2209 Phoenix Avenue, Helena, Montana. A partial Administrative Record is available at the Livingston-Park County Public Library located at 228 West Callender Street in Livingston, Montana.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous or deleterious substances from this site, if not addressed by implementing the remedial action selected in this ROD, may pose an imminent and substantial endangerment to public health, safety, and welfare, or the environment.

DESCRIPTION OF THE REMEDY

The remedy for the BN Livingston Shop Complex consists of remediation of all contaminated media to cleanup levels specified in Table 1 of the ROD, with reliance on institutional controls in certain instances.

Numerous interim actions were performed at the site since site investigation began. These actions are considered part of the selected remedy. Previously completed confirmation sampling will be reviewed and additional sampling will be performed if necessary at all interim action locations to assure these actions meet the cleanup levels.

Major components of the remedy are set forth below.

Waste

Volatile organic compound (VOC)-contaminated sludge: The selected remedy is source removal of all sludge followed by off-site disposal at a licensed Resource Conservation and Recovery Act (RCRA) subtitle C facility. All known sludge within Livingston Rail Yard (LRY) has been properly disposed off-site. Any new sources of sludge will be removed in accordance with previous DEQ-approved work plans and in compliance with all environmental laws.

Asbestos-contaminated soils and debris: The selected remedy relies on capping of the cinder pile coupled with fencing and restrictive covenants.

Soils

VOC-contaminated soils: The selected remedy is treatment of all contaminated soils to below cleanup levels. The treatment consists of either in-situ soil vapor extraction (SVE), or ex-situ SVE treatment. Ex-situ soils treated to cleanup levels will be disposed on-site. With the exception of the transfer pit manways and locomotive shop manways, all known VOC-contaminated soils have now been excavated.

Petroleum-contaminated subsurface soils: The selected remedy is installation and operation of bioventing wells until cleanup levels are achieved and maintained. This will be accomplished in two phases, with information learned in Phase I being applied to the second phase.

Petroleum-contaminated surface soils: The selected remedy will be an evaluation of site conditions compared to screening levels. If data indicate that petroleum in surface soils is a contaminant of concern, then site-specific cleanup levels will be developed and approved by DEQ. Alternatives will be evaluated followed by implementation of an approved remedial action that will achieve site-specific cleanup levels, should contamination be confirmed on-site.

PAH-contaminated soils: The selected remedy will be an evaluation of cleanup alternatives followed by implementation of an approved remedial action that will achieve cleanup levels.

Lead-contaminated soils: The selected remedy will be an evaluation of cleanup alternatives followed by implementation of an approved remedial action that will achieve cleanup levels, should lead in soils be confirmed as a contaminant of concern.

Groundwater

VOC-contaminated groundwater: The selected remedy is source removal of VOC-contaminated sludge and soils (as set forth above) followed by monitored natural attenuation (MNA) to meet cleanup levels within a reasonable time (twenty years). A contingency remedy requires active groundwater treatment in source areas using localized pump-and-treat systems if, after three years of MNA, it is determined that cleanup levels will not be met within twenty years under the natural attenuation remedy.

Free product on groundwater: The selected remedy is source removal throughout the diesel plumes of the free product to the cleanup level. This will be accomplished in two phases, with information learned in Phase I being applied to the second phase.

Dissolved phase petroleum in groundwater: The selected remedy is source removal of the free product followed by MNA for the dissolved phase to meet cleanup levels within a reasonable time (twenty years). A contingency remedy will be implemented if, after three years of MNA, it is determined that cleanup levels will not be met within twenty years under the natural attenuation remedy.

Lead in groundwater: The selected remedy will be an evaluation of cleanup alternatives followed by implementation of an approved remedial action that will achieve cleanup levels.

Private domestic use wells: The selected remedy is to identify all domestic use wells within the VOC-contaminated groundwater plume by updating the well inventory and monitoring those wells at least annually until cleanup levels are achieved throughout the plume. Any domestic use wells that are approaching or exceed EPA's maximum contaminant level for drinking water will be connected with alternate water, which typically means connection to city water, at no expense to the well owner.

Air

Indoor air/basement gas: The selected remedy will be an evaluation of site conditions compared to screening levels. If data indicates screening levels are exceeded, then sampling will be expanded as appropriate and site-specific cleanup levels will be calculated for indoor air. If cleanup levels are exceeded, installation and operation of removal systems to meet cleanup levels will be required.

In addition, the remedy calls for expanded sampling and confirmation sampling, reliance on institutional controls, and monitoring and maintenance until all cleanup levels are reached. Institutional controls required include a controlled groundwater area for the

plumes, and restrictive covenants for the diesel plumes and certain industrial properties. Waste left on-site after remedy completion includes asbestos-contaminated debris in the cinder pile, capped with a RCRA subtitle D cap, and contaminated soils at certain industrial properties restricted to industrial use.

COMMUNITY ACCEPTANCE

The majority of the community supported the Proposed Plan remedy, but expressed concerns for worker safety during implementation of remedial actions. The site includes active railyard operations. Health and safety issues were considered in the formulation of the phased diesel fuel recovery plan and will be further developed during remedial design and remedial action.

Remediation construction activities within an active railyard must be performed with the highest concern for worker safety and protection. Using planning, coordination, train-spotters, radio communication and daily safety meetings will ensure the installation, maintenance and operation of the diesel fuel recovery system can occur safely.

STATUTORY DETERMINATIONS

The selected remedy will attain a degree of cleanup that assures present and future protection of public health, safety, welfare and of the environment, and complies with federal and state environmental criteria, limitations, or requirements that are applicable or well-suited to the remedial action and site conditions. The selected remedy protects public health, safety, and welfare, and the environment, and uses permanent solutions, alternative treatment technologies or resource recovery technologies to the maximum extent practicable, and is cost-effective.

Because this remedy will result in hazardous or deleterious substances remaining on-site, DEQ will continue to periodically review the remedial action to ensure the remedy protects public health, safety and welfare, and the environment until the remedy no longer relies on institutional or engineered controls.

Original Copy Signed — 9/7/2001

Jan P. Sensibaugh — Date
Director
Montana Department of Environmental Quality

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ACRONYMS

API	American Petroleum Institute
ATSDR	Agency for Toxic Substances and Disease Registry
beta-BHC	beta-benzene hexachloride
BN	Burlington Northern
BNRR	Burlington Northern Railroad
BNSF	The Burlington Northern and Santa Fe Railway Company
BRA	Baseline Risk Assessment
BTEX	Benzene, Toluene, Ethyl benzene and Xylene
CECRA	Comprehensive Environmental Cleanup and Responsibility Act
CERCLA	Comprehensive Environmental Responsibility, Compensation and Liability Act of 1980
CFR	Code of Federal Regulations
CGWA	Controlled Groundwater Area
cis-DCE	cis-1,2-Dichloroethene
DDE	Dichlorodiphenyldichloroethene
DDT	Dichlorodiphenyltrichloroethane
DEQ	Department of Environmental Quality
DHES	Department of Health and Environmental Sciences
DNRC	Department of Natural Resources
DO	Dissolved Oxygen
DOT	Department of Transportation
EPA	Environmental Protection Agency
ERCLs	Environmental Requirements, Criteria and Limitations
FS	Feasibility Study
IRMWP	Interim Remedial Measures Work Plan
LIFE	Livingston Informed Friends of the Environment
LRC	Livingston Rebuild Center
LRY	Livingston Rail Yard
MCL	Maximum Contaminant Level
mg/L	milligrams per liter
MPDES	Montana Pollution Discharge Elimination System permit
MRL	Montana Rail Link
NCP	National Contingency Plan
NPRR	Northern Pacific Railroad
O&M	Operation and Maintenance
ORP	Oxidation-reduction Potential
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PCE	Tetrachloroethene
PCEC	Park County Environmental Council
PM-10	Particulate Matter less than or equal to 10 microns
RBCA	Risk-Based Corrective Action
RCRA	Resource Conversation and Recovery Act

RETEC	Remediation Technologies (recently changed name to ThermoRETEC)
RI	Remedial Investigation
ROD	Record of Decision
SVE	Soil Vapor Extraction
SVOCs	Semi-volatile Organic Compounds
TAG	Technical Assistance Grant
TCE	Trichloroethene
TPH	Total Petroleum Hydrocarbons
trans-DCE	trans-1,2-Dichloroethene
TSP	Total Suspended Particulate
µg/L	micrograms per liter
$\mu g/m^3$	micrograms per cubic meter of air
UST	Underground Storage Tank
VOCs	Volatile Organic Compounds
WWTP	Wastewater Treatment Plant
WQB-7	Montana water quality standards

DECISION SUMMARY

I. SITE NAME, LOCATION AND DESCRIPTION

The BN Livingston Shop Complex facility (the site) includes the Livingston Railyard (LRY) and the surrounding area where hazardous or deleterious substances have been deposited, stored, disposed of, placed or otherwise come to be located. The site is located in Park County, Montana with the majority of it within the city of Livingston. Livingston is approximately 26 miles east of Bozeman, Montana and 100 miles west of Billings, Montana (see Figure 1). Figure 2 shows the location of the LRY general facilities. The site is approximately 1.5 miles long and 0.25 miles wide and is generally bounded by Park Street on the south, Gallatin Street on the north, Fifth Street on the west and beyond the Yellowstone River on the east. Some easterly portions of the site are located outside the city limits but within Park County.

The site specifically does not include the Mission Wye facility. In addition, the site specifically excludes dioxins, furans, and polychlorinated biphenyls (PCBs) as known hazardous or deleterious substances located at the site and therefore does not include cleanup levels for these contaminants. Should previously unknown or undetected conditions be discovered regarding these contaminants, the ROD will be modified, or listing as a second site will commence.

Most of LRY is surrounded by residential land except for a strip of land zoned industrial between the main railroad line and Park Street. The passenger depot is zoned highway commercial. Much of the land east of the Yellowstone River is zoned agricultural, except for a strip of land along U.S. Highway 89 between the Yellowstone River and the proposed Rustad subdivision on the north side of the highway and the Boulder Road Industrial Park on the south side of the highway. This strip of land along U.S. Highway 89 and both the proposed Rustad subdivision and the Boulder Road Industrial Park are zoned industrial. Detailed maps describing zoning in Park County are in the Park County Zoning Plan (March 1997) and shown on Figure 3. The 1999 city of Livingston zoning map identified by section 30.13 of the Livingston Municipal Code (1999) shows zoning within Livingston.

By ordinance, the city of Livingston prohibits installation of domestic groundwater supply wells within city limits. Residential, commercial and industrial land surrounding LRY is serviced by city water. Residences located southeast of Park Street and other possible areas own private groundwater wells. Land east of the Yellowstone River is not currently serviced by city water and landowners rely on private groundwater wells for all purposes.

Both the Department of Environmental Quality (DEQ) and Burlington Northern and Santa Fe Railway Company (BNSF) have changed over the last few years as the result of reorganization and mergers. DEQ was created on July 1, 1995 by consolidating environmental programs from the Departments of Health and Environmental Sciences (DHES), Natural Resources and Conservation, and State Lands. Documents in the Administrative Record dated before July 1, 1995 refer to DHES; documents in the Administrative Record dated after July 1, 1995 refer to DEQ. The Burlington Northern

Railroad (BNRR) merged with Atchison, Topeka & Santa Fe Railway Company in 1996 and changed its name to BNSF. Documents in the Administrative Record dated before December 31, 1996 refer to BNRR; documents created after December 31, 1996 refer to BNSF.

For purposes of clarity in the ROD, the acronym DEQ will be used to refer to the current Department of Environmental Quality and the former DHES. The acronym BNSF will be used to refer to the current Burlington Northern and Santa Fe Railway Company and the former BNRR.

The CECRA facility, including the LRY site, is referred to as the Burlington Northern Livingston Shop Complex (referred to in this ROD as BN Livingston Shop Complex or the site).

II. SITE HISTORY

The BN Livingston Shop Complex includes an active railyard (LRY), which began as a major industrial railroad and maintenance shop complex that the Northern Pacific Railroad (NPRR) constructed in 1883. Original facilities included a locomotive shop, car shop, wheel shop, and boiler house. During the 1880s the passenger depot, located at Park and Second Streets, was constructed and by 1900 the overall facility had expanded to include car shops, a 54-foot turntable, and a 15-stall roundhouse. An industrial wastewater treatment plant (WWTP) was constructed in 1968. Today, two railroad mainlines extend through the site for active rail traffic. Train traffic through Livingston may range from 18 to 24 trains daily. Ten active rail sidings are maintained, along with additional tracks to adjacent facilities such as the turntable and maintenance shops.

The LRY was owned and operated by NPRR until 1970 when NPRR merged with the Great Northern Railroad, the Chicago, Burlington and Quincy Railroad and the Spokane, Portland and Seattle Railroad to form the BNRR. In 1987, Washington Corporation's Montana Rail Link (MRL) purchased the buildings within the Livingston complex from BNSF and began operation of MRL at the site. A group of shareholders owned and operated the Livingston Rebuild Center (LRC) until its sale in 2000 to Talgo-LRC, LLC and the USA Northwest, Inc. The Talgo-LRC company rebuilds locomotives and railroad cars and MRL performs locomotive repairs and maintenance. On December 31, 1996, BNRR merged with Atchison, Topeka & Santa Fe Railway Company in 1996 and changed its name to BNSF. Both MRL and Talgo-LRC continue to operate at the site.

A. Regulatory History

In 1977 BNSF submitted self-monitoring data to DEQ indicating violations of BNSF's 1974 Montana Pollution Discharge and Elimination System (MPDES) permit. These violations occurred between September 29, 1976 and January 12, 1977. On May 5, 1977, DEQ issued an administrative compliance order directing BNSF to correct all

violations within 30 days. DEQ filed a complaint against BNSF in Park County District Court on December 22, 1977 seeking an injunction prohibiting further violations and requesting civil penalties of $340,000. In January 1979 the district court approved a stipulation between DEQ and BNSF which resulted in the dismissal of this suit with prejudice and imposition of a $170,000 penalty; $100,000 was suspended contingent upon BNSF obtaining full operational compliance with its permit by January 1, 1980.

In 1985 DEQ required BNSF to investigate the potential that diesel fuel was leaking into soil and migrating to groundwater. Diesel fuel was found in several monitoring wells. Another investigation discovered VOCs in monitoring and municipal wells. In 1988, the city of Livingston shut down the Q and L Street municipal wells to eliminate VOC contamination in the city water supply and installed two new replacement wells outside of the plume.

On April 9, 1987, DEQ filed a complaint against BNSF alleging violations of Montana's Water Quality Act and seeking an injunction prohibiting further violations and requiring BNSF to prepare and submit a groundwater cleanup plan.

In the summer and fall of 1988, DEQ and BNSF entered into two administrative orders on consent which provided for the disclosure of documents related to the BN Livingston Shop Complex by BNSF and the removal of underground storage tanks (USTs).

On December 27, 1988, DEQ filed an action in U.S. District Court (Civ. No. 88-141-H-CCL) seeking to consolidate the issues raised in the two 1987 lawsuits and asserting other claims. These claims include liability under CECRA and under CERCLA for all remedial action costs incurred by the state and natural resource damages in connection with the Livingston site, as well as the Mission Wye facility, Park County landfill, and the Park County incinerator.

On July 31, 1989, DEQ and BNSF filed a draft partial consent decree with the U.S. District Court in Helena to resolve DEQ's claims against BNSF. The partial consent decree was the subject of four public meetings and a public hearing in Livingston during 1989. In light of public comments, DEQ and BNSF renegotiated many portions of the partial consent decree. A final Modified Partial Consent Decree was agreed upon and lodged with the court (U.S. District Court, Cause No. 88-141-H-CCL) on December 21, 1989. On April 6, 1990 the court preliminarily approved the Modified Partial Consent Decree and invited public comment to be filed with the court on or before April 24, 1990. At a hearing on April 27, 1990, after consideration of the comments submitted and responses given by DEQ and BNSF, the court approved the consent decree and accompanying stipulations and motions.

Both 1987 lawsuits and many of the issues in the 1988 suit were resolved in connection with the Modified Partial Consent Decree. Through a stipulation entered into in conjunction with the Modified Partial Consent Decree, both 1987 lawsuits were dismissed with prejudice and BNSF agreed to pay $1,000,000 in settlement of DEQ's past remedial action costs through June 30, 1989 and penalties; $100,000 was suspended contingent upon the quality of the work performed by BNSF. The issue of

water quality is addressed through implementation of the Modified Partial Consent Decree, work plans and addenda.

Pursuant to the consent decree, BNSF committed to perform the remedial investigation and feasibility study (RI/FS) for the site, with required oversight by DEQ. DEQ committed to selection of the proper remedy for the site through a record of decision process, upon consideration of the RI/FS, and drawing upon CERCLA and NCP for guidance or as otherwise appropriate.

In April 1991 the U.S. Environmental Protection Agency (EPA) initiated field investigations to determine whether the site should be placed on the federal Superfund National Priorities List (NPL). Based solely on the groundwater exposure pathway, the site scored 50.0 using the EPA hazard ranking system and EPA proposed the site for the NPL in August 1994. Until recently, EPA's policy required the governor of the state to request placement of a site on the NPL. No Montana governor has made such a request and the site has not been placed on the NPL.

The RI and two FSs were conducted between 1989 and 1994. During the RI and FSs, numerous interim actions were conducted and are considered part of the selected remedy.

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

Public participation in the decision making process proceeded in accordance with the partial consent decree, and sections 113 and 117 of CERCLA and section 75–10–713, Montana Code Annotated (MCA), of CECRA.

DEQ provided notice and on September 22, 1998, the Proposed Plan and two FSs for the BN Livingston Shop Complex were released for public comment. DEQ held a public meeting on September 22, 1998 to present and discuss the Proposed Plan and FSs describing alternatives considered in selecting the preferred remedy. Copies of the FSs were distributed to the repositories. Copies of the Proposed Plan were provided to the September 22, 1998 meeting attendees and were made available to the public at the information repositories. In addition, the Proposed Plan was distributed to a mailing list of 300 persons and approximately 40 newspapers and radio stations in Livingston, Bozeman, Big Timber and Billings. Public notice requesting comment on the Proposed Plan was published in the Livingston Enterprise on September 23, 1998. In addition, a display ad advertising the September 22, 1998 public meeting in Livingston to discuss the Proposed Plan was published both in the Billings Gazette and Bozeman Chronicle on September 20, 1998 and in the Livingston Enterprise on September 17 and 21, 1998. A 60-day public comment period on the Proposed Plan and FSs was held from September 22, 1998 through November 23, 1998. A public hearing was held on October 22, 1998 to receive oral comments on the Proposed Plan and FSs.

Notice of the ROD will be published and copies of the ROD will be made available to the public for review at the repositories. The ROD will also be made available on the DEQ

website (http://www.deq.state.mt.us). The ROD is accompanied by a discussion of any significant changes to the preferred remedy presented in the Proposed Plan along with reasons for the changes. Also accompanying the ROD is a Response Summary, which provides a response to each of the comments submitted in writing or orally at the hearing during the public comment period on the Proposed Plan and FSs.

The complete Administrative Record (that contains all documents related to the selection of the remedy for the BN Livingston Shop Complex) is located at:

Department of Environmental Quality
Remediation Division
Hazardous Waste Site Cleanup Bureau
2209 Phoenix Avenue
Helena, MT 59620-0901
Telephone: (406) 444-1420

A partial copy of the Administrative Record is located at:

Livingston-Park County Public Library
228 West Callender
Livingston, MT 59047
Telephone: (406) 222-0862

Additional repositories for major documents are located at:

Montana State Library, Capitol Complex, Helena, MT 59620
University of Montana Mansfield Library, Missoula, MT 59801
Montana State University, Renne Library, Bozeman, MT 59715

IV. SCOPE AND ROLE OF REMEDIAL ACTION

The purpose of the BN Livingston Shop Complex RI/FSs was to evaluate findings of previous investigations, collect additional data to characterize the nature and extent of contamination and assist in assessing current and future risks to the human health and the environment, and develop and evaluate remedial action alternatives.

The primary objectives of the RI/FSs were to:

- Investigate site physical features and define sources of contamination,
- Determine the nature and extent of contamination and evaluate contaminant fate and transport,
- Provide information on site characteristics and contaminants for use in the BRA and FSs,

- Identify applicable or well-suited Environmental, Requirements, Criteria and Limitations (ERCLs), and

- Identify and evaluate remedial alternatives to address human health and environmental risks and compliance with ERCLs.

Based on findings from previous investigations and results of the RI and treatability studies performed under the FSs, DEQ believes the data obtained is adequate for DEQ to evaluate and select an appropriate remedy for the site. The ROD contains screening levels or cleanup levels for all known contaminants of concern (COCs). Any new areas of contamination will require further data collection. Any new COCs or media will require an evaluation of clean-up alternatives and a DEQ-approved remedy.

The remedy outlined in this ROD represents the final remedial action at the BN Livingston Shop Complex; it will address principal threats to public health and the environment posed by contaminated media and compliance with ERCLs. Previously completed interim actions are considered part of the final selected remedy. Interim actions are discussed in Section VI.

V. SUMMARY OF SITE CHARACTERISTICS

Investigative activities began in October 1985. In January 1989 BNSF submitted the Environmental Site Audit Report, Livingston Rail Yard, Livingston, Montana (Envirocon, January 1989) to DEQ which summarized early investigative information. The Interim Remedial Measures Work Plan (IRMWP) was also prepared to initiate investigative and interim actions at the BN Livingston Shop Complex that would occur during negotiations of the Modified Partial Consent Decree. The IRMWP evolved into a RI work plan. The supplemental IRMWP was attached to the Modified Partial Consent Decree. In addition, over 30 supplementary work plans were written by BNSF's consultant, Envirocon, Inc., and reviewed, modified when necessary, and approved by DEQ. The RI Report (Envirocon March 1994), including appendices (volumes II through VI), presents information collected while implementing the IRMWP and supplemental work plans. Section one of the RI report lists supplemental work plans and reports that were completed during the RI investigation through July 1992. This section of the ROD summarizes information and presents tables and figures from the RI report and other documents in the Administrative Record.

A. Hydrogeology

Hydrogeological investigations were conducted as part of the RI to characterize groundwater flow and contaminant transport through the aquifer. Based on geological information in the RI report the following conclusions are made:

1) The BN Livingston Shop Complex and the greater city of Livingston overlie an unconfined alluvial aquifer composed of highly permeable, relatively homogeneous, coarse, sandy gravel deposited by the Yellowstone River. A

confining unit composed of shales, siltstones and fine-grained volcanic sandstones of the Cokedale and Miner Creek formations underlies the alluvium.

2) The saturated thickness of the aquifer ranges from 10 to 25 feet beneath most of the site but can be as great as 60 feet. Depths to groundwater vary from approximately 25 feet on the southwest end of the site to 2 to 3 feet on the northeast portion of the site near the Yellowstone River. Seasonal groundwater fluctuations average about 2 to 3 feet per year near the shop complex, but are as great as 6 feet per year near the Yellowstone River. The highest seasonal water table typically occurs in July while the low water table typically occurs in February or March.

3) Based on water table maps and aquifer pump tests completed on and near the site, the following are estimates of hydrogeological parameters:

a) hydraulic conductivity - 170 to 380 feet/day
b) hydraulic gradient - 22 feet/mile (0.004)
c) effective porosity - 15 to 25 percent
d) groundwater velocity - 2 to 10 feet/day

4) Groundwater flows northeast and east beneath the western two-thirds of the site. Beneath the eastern third of the site, groundwater seasonal flow directions can vary almost 90 degrees due to the interaction between the aquifer and the Yellowstone River. During late summer and early fall when the water table is high and the river is low, flow is eastward and more directly toward the river. As the water table drops through the winter and early spring, groundwater flow becomes more northerly and parallel to the river. This seasonal shift in groundwater flow direction causes the VOC plume to shift north and south near the Yellowstone River.

B. General Discussion of Sources

Contaminant groups attributable to the BN Livingston Shop Complex include VOCs, semi-volatile organic compounds (SVOCs), metals, diesel fuel (both free product and dissolved phase), and asbestos. These are hazardous or deleterious substances under CECRA and include the following COCs: chlorobenzene, 2-chlorotoluene, 1,4 dichlorobenzene, methylene chloride, tetrachloroethene (PCE), trichloroethene (TCE), vinyl chloride, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, lead, cis-1,2 dichloroethene (cis-DCE), trans-1,2 dichloroethene (trans-DCE), and asbestos. Petroleum hydrocarbons are present as free product (diesel fuel) on top of groundwater, as diesel fuel adsorbed to surface and subsurface soil, and as dissolved phase petroleum hydrocarbons in the groundwater. Metals were found most often in soil, sludge, and the cinder pile; lead was also detected in groundwater. Asbestos contamination is limited to the cinder pile.

Known areas where COCs exceeding cleanup levels remain at the BN Livingston Shop Complex are in the groundwater for VOCs, lead, and diesel fuel; above the groundwater

for diesel fuel; in subsurface soils for VOCs and diesel fuel; in surface soils for PAHs; and at the cinder pile for asbestos. Suspected areas where COCs exceeding cleanup levels remain at the site are in surface and subsurface soils for lead contamination and petroleum and other contaminants; and basement gas for VOCs. Known areas where COCs exceeding cleanup levels were removed since the issuance of the Proposed Plan are surface and subsurface soil at the electric shop for VOCs; confirmation soil samples were collected at the transfer pit and locomotive shop manways for VOCs, but the data has not been evaluated. All areas are subject to confirmation sampling review, and additional sampling, if appropriate, to ensure cleanup levels have been met.

C. Contaminant Fate and Transport

Figure 5 depicts a conceptual model and provides an overview of the primary contaminant transport pathways and mechanisms. The conceptual model shows the relationship between source areas and transport pathways. The most important contaminant transport mechanism is infiltration. VOCs, lead, and diesel fuel have infiltrated downward through subsurface soil to groundwater from several source areas such as unlined sludge pits, wastewater manways and drain lines, USTs, spills and leaks. Other contaminant transport mechanisms of importance include VOCs partitioning between subsurface soil and groundwater, diesel fuel dissolving slowly into groundwater, and VOCs volatilizing and diffusing from groundwater into the vapor phase within subsurface soil pores. VOC vapors then migrate through soil to ambient air and building basements through earth floors and cracked foundations. Friable asbestos may migrate to ambient air through wind scouring and dispersion. For a complete discussion of the contaminant transport mechanisms and pathways, see each appropriate section in the RI report (sludge, soil, diesel fuel, air and groundwater).

D. Specific Contaminated Media, Contaminants, Volume and Extent of Contamination

Sludge

Sludge was generated during wastewater treatment operations and was composed of materials from the shop complex. Sludge originating from the treatment of wastewater was composed primarily of solid materials, petroleum hydrocarbons and water. During the RI investigation, sludge was discovered in five unlined disposal pits including the American Petroleum Institute (API) separator pond, overflow pond, WWTP sump and two pits located at the cinder pile. Sludge was also present at the in-line grit chamber, various manways, surge tank, and the WWTP grit chambers. The total volume and areas of sludge identified (and then removed) from the BN Livingston Shop Complex are listed in Table 2.

Sludge was analyzed for VOCs, SVOCs, metals and RCRA characteristics. The sludge contained PCE ranging from 0.7 to 25 milligrams per kilogram (mg/kg); TCE ranging from 5.7 to 10 mg/kg; cis-DCE ranging from 1 to 450 mg/kg; cholorobenzene ranging from 1 to 450 mg/kg; and 1,4-dichlorobenzene ranging from 1.1 to 94 mg/kg. Table 3 lists the analytical results of sludge.

Based on these levels and downgradient groundwater sampling, DEQ determined the sludge was a source of contamination to groundwater, as well as a potential source of windborne contamination. Beginning in 1989 sludge was excavated from all known sources. This interim action is explained in Section VI.

Soil

Subsurface soil

As part of the RI, 223 test pits were excavated and 243 subsurface soil samples were collected and analyzed for VOCs, SVOCs, TPH, metals, pesticides and PCBs. The subsurface soil excavation focused on nine areas of suspected contamination: the shop complex, WWTP facility, Church Universal and Triumphant facility, livestock-car clean-out pile, oil-reclamation sludge disposal area, API separator and overflow ponds, cinder pile, freight-train and depot fueling facilities and the C & P Packing pits (see Figure 2). Between 1989 and 1991 additional work plan addenda were approved by DEQ to investigate other areas not originally included in the IRMWP. These areas included: oil-stained river gravel at the former WWTP drain line outfall in the Yellowstone River; contaminated soil at the track-pan installation area east of MRL shops; along drain lines and the electric shop (soil gas survey); around the lube-oil building and turntable pit; and along the mainline right-of-way east of the Yellowstone River. In January 1992 more investigations were completed at the WWTP septic tank drain field; C & P Packing pits; transfer pit; north drainage ditch; and the waste-oil reclamation plant (see Figure 2).

Table 4 and Table 5 show the concentration of contaminants found in subsurface soil samples. PCE was the predominant VOC found in samples at concentrations ranging from 5.4 to 420,000 micrograms per kilogram (μg/kg). The highest PCE concentrations were found near the vapor degreaser pit located in the electric shop. TCE was found in samples at concentrations ranging from 5.0 to 1,800,000 μg/kg. Concentrations of cis-DCE ranged from 5.7 to 710,000 μg/kg. Vinyl chloride was detected in one sample at 11,000 μg/kg. Chlorobenzene was identified in the samples in concentrations ranging from 6.4 to 34,000 μg/kg. Concentrations of 1,4-dichlorobenzene ranged from 6.6 to 162,000 μg/kg. Methylene chloride was detected in eight samples, but laboratory contamination of the samples was suspected.

Phenanthrene was the most commonly detected SVOC in subsurface soil. Phenanthrene ranged from 90 to 80,000 μg/kg. Most SVOCs were detected beneath portions of the shop complex, drain lines, manways and sludge disposal pits.

Average total metal concentrations were within the background ranges, with the exception of lead and chromium, which were primarily detected beneath sludge pits and drain lines. One sample contained PCBs and two samples contained the pesticide beta BHC. The largest TPH concentrations were detected around the fueling facilities, beneath sludge disposal pits, near manways and drain lines and in the diesel fuel smear

zone. TPH was identified at concentrations ranging from <10 parts per million (ppm) to 6500 ppm. Table 6 lists the estimated volume of contaminated soil at the time when the RI was submitted.

Surficial Soil

Surficial soil samples were collected and analyzed in eight areas: 1) the cinder pile, 2) API separator and overflow pond, 3) freight-train refueling area, 4) WWTP and sump area, 5) in-line grit chamber, 6) passenger-train (depot) refueling area west of the shop complex, 7) areas not significantly impacted by past or present operations, and 8) areas currently being managed by MRL, including the post-1943 relic slough. Five surficial soil samples were collected in the city of Livingston. Details of the surficial soil investigation are described in the Surficial Soil Investigation Report, Livingston Rail Yard (Envirocon, July 1992) which is part of the RI.

Table 7 lists sample results for surficial soil. Sixty-seven samples were collected and analyzed for VOCs, PAHs, pesticides and metals. TPH was not analyzed for in surficial soils. PCE was detected in concentrations from 5.2 to 24.3 μg/kg. Methylene chloride was detected in some samples; however, laboratory contamination of those samples was suspected.

PAHs were detected in all areas and at several locations within the city of Livingston. PAHs are common products of incomplete combustion and constituents of diesel fuel. Fluoranthene and pyrene were the most commonly detected PAHs. Fluoranthene and pyrene were detected in the samples at concentrations ranging from 420 to 27,000 μg/kg and 440 μg/kg to 27,000 μg/kg, respectively. The largest PAH concentrations were detected in sludge disposal areas. Some surficial soil samples collected from the city of Livingston areas contained low levels of the pesticides 4,4'-DDE and 4,4'-DDT. Except for lead, barium, and chromium, average metal concentrations were within background ranges expected for this area of the country. The largest lead and chromium concentrations were near sludge disposal areas.

Diesel Fuel

Two separate free product diesel fuel plumes were originally discovered in 1985: the freight-train refueling area (freight train) and depot plumes (see Figure 6). The freight-train plume extends northeast from the former freight-train fueling area past the WWTP, and the depot plume emanates from the passenger-train (depot) refueling area. Both plumes extend beyond BNSF property. Although free product was located at the depot-refueling area initially, there does not appear to be diesel fuel on top of groundwater in the depot area. A manway and storm drain located in the B Street underpass may act as a sink, which drains groundwater and diesel fuel from this area. During precipitation events, diesel fuel was flushed from contaminated soils by storm water into the storm drain and eventually into Fleshman Creek. Diesel fuel was reported flowing in the B Street storm drain and sewer outfall, but is no longer detected there. Diesel fuel is no longer observed in the B Street underpass after heavy precipitation events. When the B Street storm drain was cleaned in May 1999, no diesel fuel was observed in the drain

line. TPH was detected in monitoring wells (especially L-87-7 and L-87-8) near and within the depot plume and freight-train plume when TPH monitoring was conducted in 1989 through 1992; concentrations ranged from <0.1 mg/L to 9.9 mg/L and <0.1 mg/L to 34 mg/L, respectively. Table 8 summarizes TPH analytical data from May 1989 through May 1992. One groundwater sample in the freight-train plume contained 222 mg/L, but a bladder pump failure is suspected of contaminating the sample. TPH was detected south of Park Street in monitoring wells numbered 1 and 3.

The RI focused largely on the freight-train plume. The freight-train plume covers an area of approximately 30 acres. DEQ originally estimated the volume of diesel fuel in the ground at 1,600,000 gallons. Envirocon estimated the amount of diesel fuel at 300,000 to 600,000 gallons in the RI (March 1994). Envirocon subsequently estimated the volume of free product to be 150,000 gallons. Therefore, the estimated volume of diesel fuel on top of groundwater and adsorbed to soil ranges from 150,000 to 1,600,000 gallons. The estimated volume of free product in the freight train and depot plumes will be re-evaluated in Phase I of the selected remedy.

The smear zone is the area of diesel contamination above and below (approximately 6 feet) the groundwater table, which contains diesel, adsorbed to soil resulting from fluctuating groundwater. Table 5 summarizes TPH analytical results for subsurface soil. The estimated total volume of contaminated alluvial material within the smear zone of the freight-train plume is 275,000 cubic yards. The extent of the depot plume containing residual diesel fuel is approximately 10 acres. The estimated total volume of contaminated alluvial material within the smear zone of the depot plume is 70,000 cubic yards. The estimated volume of contaminated residual diesel fuel will be re-evaluated in Phase I.

Diesel fuel present as free product and adsorbed to soil is weathered and contains low concentrations of benzene, toluene, ethyl benzene and xylene (BTEX) compounds and other VOCs associated with diesel fuel. The flash point of free product in the freight-train plume ranges from greater than 140°F to 210°F. The specific gravity ranges from 0.881 to 0.898. Some free product contains low levels of cadmium, chromium and lead. Free product in the northeast portion of the freight-train plume contains low concentrations of VOCs.

Low levels of TPH, SVOCs, BTEX (benzene, toluene, ethyl benzene and xylene), associated with diesel fuel, and VOCs are dissolved in groundwater. The primary source of these contaminants is diesel fuel on top of groundwater and adsorbed to soil in the smear zone.

Since May 1989, free product thickness was monitored in certain wells located in the freight-train diesel plume. Monitoring wells were screened across the water table. Figure 7 shows the apparent free product thickness of diesel fuel in feet. Table 9 from the 2000 Annual Groundwater Sampling Report (Envirocon, April 2000) shows apparent free product thickness measurements from February 1995 through November 2000. Table 10 from the 1996 Annual Groundwater Sampling Report, Livingston Rail Yard (Envirocon, September 1996) shows apparent free product thickness measurements

from August 1994 through May 1996. Free product thickness has remained fairly constant from 1991 through 2000. Presently, there are no monitoring wells located in the center of the plume; therefore, no free product thickness measurements are available for this area. The RI report speculates the greatest free product thickness is in the center of plumes.

Table 5 shows TPH concentrations in monitoring well drill cuttings outside and within the freight-train plume. TPH concentrations in the alluvial smear zone ranges from 1,050 to 6,500 parts per million (ppm).

Air

Ambient air (outdoor air) and indoor air (within a residence) were sampled during the RI. Ambient air samples were collected upwind and downwind of the site and analyzed for particulate matter less than or equal to 10 microns (PM-10), total suspended particulate (TSP), PAHs and metals. During removal and investigative activities, work-zone air was monitored within work areas for total particulate, VOCs, and PAHs. Eight indoor air sampling events were conducted in homes on the north side and south side of the LRY to determine if excessive concentrations of PCE, TCE, cis-DCE and trans-DCE were entering basements and homes.

Ambient Air

Meteorological data was collected during ambient air and indoor air sampling events. During the period from November 11, 1990 through March 31, 1992 the average wind speed was 12.5 mph. The wind direction was 231 degrees (from the southwest). The percentage of calm hours was 0.0%. The maximum temperature for the period was 93°F. The minimum temperature was –24°F. The average temperature was 43°F. The ambient air data was taken over a two year period, with PM-10 samples collected every 6 days. DEQ evaluated data from Montana's Department of Transportation Maintenance Division road weather informational system for Livingston between January 1999 and July 2001. The average monthly wind gust is approximately 92 miles per hour (mph); the maximum average monthly wind gust is 138 mph and the minimum average monthly wind gust is 66 mph.

As shown on Table 11, mean PM-10 concentrations were 18 $\mu g/m^3$ for the upwind site and 16 $\mu g/m^3$ for the downwind site. The peak reporting concentrations for the upwind and downwind sites were 56 $\mu g/m^3$ and 34 $\mu g/m^3$, respectively. These levels were below the PM-10 standards shown on Table 11. TSP samples were collected and compared to TSP standards. The levels measured were below these standards. PAH concentrations are listed on Table 12 and are at levels below the screening criteria levels generated in the BRA. Screening criteria levels were also generated for metals listed on Table 13. Metal levels in ambient air were obtained by analyzing PM-10 samples and were below the screening criteria. Lead concentrations were below the ambient air quality standard for lead.

Indoor Air

DEQ conducted three indoor air sampling events; BNSF conducted five additional indoor air sampling events as part of the RI. This section will summarize two of these sampling events. These and other indoor air sampling events are described in detail in the RI report and Phase I through Phase IV basement gas investigation reports (see Section XIII, References, for a complete citation of these documents).

February and March 1992 Sampling Event: Three ambient air, six soil-gas and 19 residential samples were collected and analyzed during the February and March 1992 sampling event. Table 14 summarizes PCE, TCE, cis-DCE and trans-DCE analytical results for the February 1992 sampling event. Table 15 summarizes PCE, TCE, cis-DCE and trans-DCE analytical results for the March 1992 sampling event. Table 16 is a statistical summary for chemicals detected in indoor air. Table 17 summarizes vinyl chloride analytical results for the March 1992 sampling event. Figure 8 shows the sample locations and analytical results for the February and March 1992 indoor air sampling event. These results are located on the February 1991 groundwater plume map.

All indoor air samples (and outdoor air samples) contained detectable concentrations of PCE ranging from 0.56 $\mu g/m^3$ to 82.1 $\mu g/m^3$. TCE was not found in outdoor samples, but was detected in small concentrations in several area residences located upgradient from the site, and in low concentrations from 0.21 $\mu g/m^3$ to 3.33 $\mu g/m^3$ in residences within the study area. The cis-DCE and trans-DCE compounds were detected in only a small number of samples. Vinyl chloride was found in the primary and duplicate sample from home SE-2 at 0.8 $\mu g/m^3$ and 0.64 $\mu g/m^3$, respectively.

Based on sample analyses from the February and March 1992 sampling event and evaluation by toxicologists, VOCs posed an unacceptable risk in indoor air at three homes (SE-5, NE-3, and NE-1). DEQ mitigated VOC vapors in home SE-5 by installing a vapor removal system in the crawl space. Subsequent sampling showed the vapor ventilation system was effective in removing VOC vapors. The homeowners of home NE-3 refused a ventilation system. Home NE-1, with the highest concentration of PCE (70.2 $\mu g/m^3$), was temporarily abandoned. DEQ will evaluate the status of these homes during the remedial design process.

January and February 1993 Sampling Event: Residences with basements, crawlspaces, and mobile homes were investigated during the January and February 1993 sampling event. Except for mobile homes without basements, both living areas and basements were sampled. Sixty-eight indoor air samples were collected from 36 residences located on the north and south side of the LRY. Fifteen residences contained crawlspaces, 15 contained cement basements, three contained earthen basements and three were mobile homes. Table 18 lists PCE sample results for the January and February 1993 sampling event. Nine residences contained detectable concentrations of PCE, which ranged from 4.5 $\mu g/m^3$ to 19.0 $\mu g/m^3$; five residences contained PCE concentrations below the ambient air concentration of 10.2 $\mu g/m^3$. Figure 9 shows the sample location and results of the January and February 1993

indoor air sampling event. The risk from indoor contamination air is discussed in Section VII.

Groundwater

The Livingston aquifer is a shallow, unconfined, coarse, alluvial aquifer. PCE, TCE, cis-DCE, chlorobenzene, trans-DCE and 1,4-dichlorobenzene are the predominant VOCs dissolved in the aquifer. PCE was detected in the groundwater samples ranging in concentrations from 0.5 μg/L to 850 μg/L. TCE was detected the samples ranging in concentration from 0.5 μg/L to 73 μg/L. Cis-DCE was found in the samples ranging in concentrations from 1.0 μg/L to 2550 μg/L. Chlorobenzene was detected the samples ranging in concentration from 1μg/L to 2,100 μg/L. Trans-DCE was detected in the samples ranging in concentration from 1 μg/L to 31 μg/L. The minimum concentration of 1,4-dichlorobenzene was detected in samples ranging in concentration from 0.5 μg/L to 150 μg/L. See Table 19 for more information on VOCs in groundwater.

Figure 10 shows the average PCE concentrations in groundwater from May 1989 through May 1992. VOC contamination in groundwater generally decreases downgradient from the electric and locomotive shops. This pattern is typified by the drop in concentrations of VOCs in the direction of groundwater flow from the electric shop toward the Yellowstone River to the east.

Other VOCs dissolved in groundwater are listed on Table 19 (includes groundwater monitoring data through May 1992). Some VOCs, such as naphthalene and isopropylbenzene, are constituents of diesel fuel; other VOCs, such as sec-butylbenzene, n-propylbenzene and 1,2,4-trimethylbenzene are chemical constituents of crude oil**.** Since diesel fuel is refined from crude oil, these constituents are also related to diesel fuel contamination. Additional groundwater monitoring data is available in annual groundwater monitoring reports from May 1993 through May 2000 (refer to Section XIII of the ROD for a complete citation of these groundwater monitoring reports). The VOC plume extends from the shop complex to the East Side of the Yellowstone River.

Groundwater contamination levels in the aquifer exceed the human health standards for VOCs set forth in the Environmental Requirements, Criteria and Limitations (ERCLs) attached as Appendix A. However, groundwater data collected from May 1989 through May 1992 confirms that VOC concentrations were higher than are seen in current data (through 2000) and are decreasing with time. This decrease is presumed to be the result of these solvents not being used and disposed of at the site and most VOC sources, including sludge and soil with high VOC concentrations, having been removed during interim actions. Dilution by groundwater through flow and dispersion in the aquifer has also reduced VOC concentrations. Figures 10 and 11 depict the estimated decrease in PCE concentrations in groundwater from 1992 and 2000, respectively. Other VOCs have also decreased in groundwater and DEQ expects all VOC concentrations in groundwater to continue to decline.

Figure 12 shows the municipal and private well locations west of the Yellowstone River that were either investigated or sampled during the RI. The new Billman Creek and Clinic replacement public water supply wells, installed as a result of contamination in Q and L Street wells from the LRY, are located south and west of the Park High School. Table 20 lists sampling results for municipal wells. PCE was detected five times in the Q Street well at less than 1.0 μg/L. PCE was detected in the L Street well twice at less than 1.0 μg/L. Contamination was not detected in any other municipal well. Table 21 lists sampling results from private wells. PCE contamination was detected in six private wells and ranged from 0.6 μg/L to 96 μg/L. Other VOCs and TPH were also detected in private wells, with four of the wells containing levels over the MCL. The Proposed Plan states that no one is known to currently be using groundwater above MCLs.

Figure 15 identifies the location and sampling results for three private wells BNSF sampled in October 1998 and seven private wells sampled in September 1999. All of these wells were located east of the Yellowstone River. PCE concentrations ranged from <0.5 μg/L and 1.5 μg/L.

Table 8 summarizes TPH analytical data from May 1989 through May 1992. TPH was detected in several on-site monitoring wells, especially L-87-7 and L-87-8. TPH was detected south of Park Street in off-site monitoring wells numbered 1 and 3. Dissolved metal results are listed in Table 22. Metals were detected in monitoring, municipal and private wells. WQB-7 levels for lead were exceeded in six monitoring wells.

Yellowstone River Surface Water and Sediment

Figure 13 shows the locations where four sediment samples were collected from the banks of the Yellowstone River in March 1990. These samples were collected at the Sacajawea slough outfall (SS-063), at locations downgradient from the abandoned BNSF WWTP discharge line (SS-061 and SS-060) and at one upstream location (SS-064). Table 23 lists and identifies results of the Yellowstone River gravel and sediment samples. Sediment samples are identified with the letters SS. Other samples listed on Table 23 with the letters RG- and TP- refer to samples collected during the river gravel investigation. All four sediment samples, including the upstream sample (used as background), contained detectable concentrations of toluene and TPH. Arsenic, barium, chromium and lead were also detected in sediment. No VOCs, SVOCs, PCBs or pesticides were detected in the samples.

Figure 14 shows the locations of surface water samples collected in the Yellowstone River. Three samples were collected both upgradient and downgradient from the BN Livingston Shop Complex. Table 24 lists sample results for VOCs, TPH, SVOCs, PCBs, pesticides, and metals. PCE and 2-chlorotoluene were detected at low levels downgradient from the site. These levels were below WQB-7 standards. TPH was detected in both an upgradient and downgradient sample. No SVOCs, PCBs or pesticides were detected. Arsenic was detected in most of the samples and it is suspected to be related to Yellowstone Park thermal discharges to the Yellowstone River.

Asbestos

Asbestos was reportedly disposed of and buried in the cinder pile. The cinder pile covers about 6.3 acres and is shown on Figure 2. It is approximately 633 feet long, 333 feet wide and 20 feet high and contains approximately 202,000 cubic yards of a combination of cinders and other solid waste; the cinders are a waste product resulting from burning coal in steam locomotives.

On November 1, 1990 DEQ collected samples of materials obtained from the surface of the cinder pile. The three samples contained chrysotile asbestos. Sample results for DEQ's asbestos detections are found in Appendix C. Two separate sampling events in June 1991 provided no evidence of asbestos.

VI. DESCRIPTION OF INTERIM ACTIONS

To reduce contaminant migration to groundwater, DEQ and BNSF conducted interim actions, including source removal, during the RI and FSs. Pursuant to a DEQ enforcement action, BNSF began removing leaking underground storage tanks, associated piping and soil in 1988. In November 1989, work began to temporarily contain WWTP sludge until it could be shipped off site for disposal. Many other early interim actions helped reduce the potential for exposure to contamination and limit contamination migrating to groundwater. Consequently, interim actions were evaluated in the two FSs and are considered to be part of the selected remedy. Interim actions and certain voluntary actions conducted by MRL and LRC to remove contamination from the site are shown in Figure 4 and include the following:

1) Abandonment and replacement of two contaminated city wells:

DEQ sampled the Q and L Street municipal wells on the East Side of Livingston in 1988 and found PCE contamination below MCLs. As a result of this contamination, the city of Livingston discontinued using the wells. In 1989 BNSF agreed to provide the city of Livingston with up to $1.7 million to install new municipal wells and modify the municipal water distribution system. The city permanently abandoned these wells in 1990 and replaced them with the Billman Creek well near Billman Creek and the Clinic well at Cambridge and South 14th Streets in the southwestern section of the city, away from groundwater contamination. A new city water line with 10 connections for potential new businesses along Gallatin Street near the city shops was also installed.

2) Replacement of leaking wastewater lines and manways:

In 1986, one of the first environmental projects for LRC was to replace leaking wastewater lines and manways. In 1988, LRC sleeved old sewer lines, replaced some manways, and had the system hydrostatically tested by Olympus Environmental in 1990 and 1994. The tests indicated some manways were leaking. Subsequently, LRC replaced four manways.

3) Removal of 14 underground storage tanks, associated piping and visibly contaminated soil:

In 1988, DEQ and BNSF signed the Storage Tank Monitoring, Testing, Reporting and Corrective Action Administrative Order on Consent. The purpose of the order was to investigate environmental conditions at the BN Livingston Shop Complex concerning underground storage tanks (USTs). The investigation was conducted in accordance with the Work Plan for the Removal of Storage Tanks, Piping and Contaminated Soils (RETEC, October 27, 1988). The Summary Report for the Removal of Storage Tanks, Piping and Contaminated Soils & Gravels, Livingston Fueling Facility, Livingston, Montana (RETEC, April 1989) describes the number of USTs removed, the piping associated with each tank and the volume of contaminated soil removed at each tank location. See Table 25 for volumes of soil removed during the storage tank removal. In the Summary Report Management of Containerized Materials, Tank Removal Program, Burlington Northern Fueling Site, Livingston, Montana (RETEC, September 1989) analytical results are discussed along with alternatives considered for disposing of the wastes. The contaminated soil was sent to another BNSF site in Nebraska for treatment.

4) Removal and disposal of approximately 12,500 tons of WWTP sludge from four unlined pits and other containment areas:

Under the Sludge Removal-Action Work Plan, Livingston Rail Yard, Livingston, Montana (Envirocon, May 29, 1992), sludge located in the WWTP sump and cinder pile lagoon was excavated and placed on temporary liners beginning in November 1989. The purpose of the source control action was to reduce VOCs migrating from sludge to groundwater. In 1992, DEQ prepared a Request for a Time Critical Removal Action Memorandum to remove and dispose of sludge from the LRY. The memorandum directed BNSF to prepare a Sludge Removal - Action Work Plan in 1992. After DEQ approved the work plan, approximately 7,000 tons of sludge was excavated, stabilized with kiln dust and sawdust, and transported to the U.S. Pollution Control, Inc. Grassy/Grayback Mountain Facility in western Utah for disposal.

During Phase II of sludge removal activities, approximately 5,500 cubic yards of sludge buried in the cinder pile was excavated, stabilized, transported in railcars and disposed of at East Carbon Development Corporation's industrial landfill near Price, Utah.

5) Removal of approximately 3,000 pounds of chlorinated solvents from soil using eight in-situ SVE systems from 1992 through 1994:

From approximately 1992 through 1994 BNSF tested and then operated eight SVE systems in areas with high VOC concentrations. Systems consisted of one or more vertical SVE wells connected to a vacuum pump. SVE systems were

located at the electric shop, transfer pit manways, locomotive shop manways, main WWTP manways, WWTP sump area, cinder pile, waste oil recycling plant, and in-line grit chambers. Air samples were collected to calculate individual VOC removal rates and estimate the total VOCs removed from soil. An estimated 3,000 pounds of VOCs were removed from soil at the eight SVE systems.

6) Removal of approximately 50 cubic yards of contaminated gravel from the Yellowstone River:

On January 24, 1990 a reportedly small volume of oil leaked from the abandoned wastewater treatment plant discharge line into the Yellowstone River bed. To eliminate future discharges, BNSF removed oil from an in-line sump and permanently plugged the discharge line with concrete. The U.S. Army Corps of Engineers, Soil Conservation Service, and DEQ approved sediment removal operations in the Yellowstone River. An area approximately 100 feet by 30 feet of oil-stained river gravels was excavated. Approximately 30 tons of contaminated river gravels was hauled to the API separator pit, mixed with sludge and eventually shipped off-site for disposal.

7) Removal of 600 tons of contaminated soil in front of MRL shops and installation of track pans to contain dripping oil from locomotives:

In October 1990, MRL excavated approximately 14 inches of contaminated soil from under each set of tracks east of the MRL shop building. The soil was replaced with new ballast. Fourteen inches of soil was also removed from between the tracks. Visibly stained contaminated soil beneath the 14-inch depth was removed and stock piled until it was sampled. Track pans were installed on top of new ballast to contain waste oil spills and fuel that drips from locomotives being repaired at MRL. Piping connected to track pans and buried underneath railroad tracks diverts liquid wastes to the on-site WWTP. MRL removed approximately 500 tons of contaminated soil during this project. The soil was shipped to a land farm near East Helena for treatment. BNSF later removed an additional 100 tons of visibly contaminated soil, which was also shipped to the East Helena land farm for treatment.

8) Removal and disposal of visible asbestos from the surface of the cinder pile:

In November 1990 DEQ detected asbestos in waste material located on the cinder pile. Under the Cinder Pile Asbestos Work Plan, the cinder pile investigation was performed in June 1991. Visible asbestos was collected in approximately three plastic bags and properly disposed of at the Park County landfill. Two sample events were conducted at wind speeds greater than 15 miles per hour and less than 15 miles per hour. No asbestos was detected in the air during the sampling events.

9) Removal and disposal of PCE contaminated backfill from the vapor degreaser pit:

During the week of July 17, 1995 about 40 yards of concrete debris, soil and cobbles were removed from the vapor degreaser pit. Several unsuccessful attempts were made to treat the material to site cleanup levels. On April 8, 1998 BNSF shipped the soil to a hazardous waste incinerator for disposal in Utah. The concrete debris was steam-cleaned and remains on-site awaiting final disposition.

10) Removal of approximately 2,700 gallons of floating diesel fuel from groundwater while testing various diesel removal technologies, 1990-1994:

Seven treatability studies were performed from 1990 through 1994 to investigate the best way to remove diesel fuel from groundwater. Tests included installation and operation of a recovery trench, dual-pump recovery system in LPW-1, and five passive and active recovery systems conducted in the freight train plume. Active recovery tests pumped groundwater to increase the flow of diesel fuel into recovery wells; passive recovery tests removed diesel fuel from groundwater with a skimmer. Approximately 2,700 gallons of diesel fuel was removed while testing these technologies.

Of the five field-scale free product recovery tests designated Test Cells 1 through 5 , Test Cell 1 evaluated free product recovery using a product-only skimmer. Test Cell 2 evaluated two-pump product recovery on the periphery of the freight-train plume. Test Cell 3 also evaluated two-pump product recovery east of the WWTP. Test Cell 4 evaluated the efficiency of a two-pump product recovery system with water treatment and reinjection. Test Cell 5 was installed to evaluate various passive recovery techniques and equipment. This test was not performed because diesel fuel did not re-enter some recovery wells; it is suspected that air rotary drilling evacuated diesel fuel from around recovery wells. These tests are described in greater detail in the Final Draft Primary Hydrocarbon Feasibility Study Report (Envirocon, January 1998). Approximately 3,000 gallons of diesel fuel were removed from groundwater during operation of Test Cells 1 through 4.

11) Retrofit WWTP grit chambers:

In 1991 after sludge was removed from the WWTP grit chambers, LRC pressure washed the interior of the concrete chambers and applied a sealant to the interior wall. Since current wastewater flow from the shop complex is significantly less than the original design of the WWTP, a smaller steel container, approximately 10 feet by 6 feet by 60 feet, was installed to replace the original grit chambers which are no longer used for wastewater storage.

12) Removal and treatment of soils beneath the vapor degreaser pit – Electric Shop:

At the release of the Proposed Plan, contaminated soil remained beneath the vapor degreaser pit at the electric shop and transfer pit manways. This was the largest remaining known source of VOC contamination to groundwater. The soil beneath the electric shop has since been excavated pursuant to an approved interim action work plan and is presently being treated ex-situ. The transfer pit manways and locomotive shop manways await disposition. Once soils are treated to cleanup levels, they may be placed on-site in an appropriate location. This interim action is considered part of the selected remedy to be implemented because it had not been performed when the Proposed Plan was issued.

VII. SUMMARY OF SITE RISKS

A. Public Health Studies

Early in the RI, DEQ received many inquiries and complaints from local residents about a reportedly high number of cancer cases and other community health concerns in Livingston. Citizens wanted to know if health problems in the area could be attributed to contaminants from the BN Livingston Shop Complex. DEQ asked the federal Agency of Toxic Substances and Disease Registry (ATSDR) to investigate these reports.

After reviewing the state cancer registry, ATSDR and DEQ began a pancreatic cancer study in February 1989 called the Investigation of a Cluster of Pancreatic Cancer Deaths in Livingston and Park County, Montana (ATSDR, September 1992**)**. This report concluded there was an elevated number of pancreatic cancer cases in Livingston from 1980 to 1989 and recommended a more rigorous epidemiological study to investigate whether environmental factors and pancreatic cancer in Livingston were related. In the follow-up study, Pancreatic Cancer Mortality and Residential Proximity to Railroad Refueling Facilities in Montana: A Records-Based Case-Control Pilot Study (ATSDR, December 1994), ATSDR concluded that residential proximity to railroad refueling facilities, as determined at the time of death, was not associated with pancreatic cancer mortality in Montana.

In February 1997 DEQ and ATSDR held a public meeting in Livingston to discuss the results of the draft ATSDR public health assessment for the BN Livingston Shop Complex. The final public health assessment document entitled Petitioned Public Health Assessment, Burlington Northern Livingston Complex, Livingston, Park County, Montana (ATSDR, September 30, 1997), concludes that there is no current health risk from contaminants at the site. ATSDR assumed that no one is currently using contaminated groundwater, that indoor air concerns were mitigated, and that workers would unlikely have direct contact with on-site soil in quantities large enough to produce illness. Also, ATSDR's document did not evaluate potential future risks. The DEQ Baseline Risk Assessment (BRA), Livingston Rail Yard (Camp Dresser & McKee, Inc., May 1993) evaluated both potential current and future risks and identified, among other

things, a potential increased cancer risk in the general population near the site based on exposure to contaminated groundwater and a potential increased cancer risk to on-site worker based on exposure to contaminated surficial soils.

B. Baseline Risk Assessment

The BRA for the BN Livingston Shop Complex was completed in 1993. It provides a basis for taking action and concludes which analyzed exposure pathways must be remediated. The BRA serves as the baseline for indicating what risks may exist if no remedial actions are conducted at the site. As part of the RI/FSs, the human health and ecological risk assessments, which comprise the BRA, were developed to help DEQ determine actions necessary to reduce potential current and future risks from hazardous and deleterious substances. EPA guidance requires a BRA to provide an analysis of baseline risk and the need for cleanup action, a basis for determining cleanup levels that are protective of public health and the environment, a basis to compare potential health and ecological impacts of various cleanup alternatives, and a consistent process to evaluate and document potential public health and ecological threats at the site.

The objective of the Human Health Risk Assessment was to develop reasonable but conservative estimates of potential current and future exposures in order to calculate potential current and future human health risks due to contaminants released from the site. The objective of the ecological risk assessment is to develop reasonable yet conservative estimates of potential exposures so that ecological risk estimates can be derived for COCs in all relevant media.

C. Human Health Risks

Contaminants of Concern

Screening of chemicals detected at the BN Livingston Shop Complex was based on toxicity, mobility, frequency of detection, association with site activities, comparison with background concentrations and human nutritional requirements. Screening ensures that only those chemicals attributable to contamination and likely to contribute to health risks are analyzed through the remainder of the BRA process. Chemicals that remain after this screening are called COCs. Based on this screening, COCs for groundwater are chlorobenzene, 2-chlorotoluene, 1,4-dichlorobenzene, cis-1, 2-dichloroethene, methylene chloride, tetrachloroethene, trichloroethene, vinyl chloride, and lead. For surface soil, COCs are benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, and lead. For indoor air, COCs are cis- and trans-dichloroethene, tetrachloroethene, trichloroethene and vinyl chloride. A single COC, 2-chlorotoluene, is selected for sediment. COCs are listed on Table 26. No COCs are identified for surface water. No COCs are selected for subsurface soil based on direct contact because a screening analysis showed that exposure to subsurface soil is not likely to impact the health of workers who may come into contact with it. However, chemicals in subsurface soil are evaluated for their

potential to contaminate other media, such as air and water, in the future. COCs are not selected for ambient air and soil gas because screening analyses showed that exposures to chemicals in these media are not expected to impact the health of workers or residents who are most likely to be impacted.

Exposure Assessment

The goal of the exposure assessment is to estimate reasonable maximum exposures (RMEs) in the absence of any future remedial actions for populations that may be exposed to contaminants related to the site. RME estimates are intended to be protective of at least 95% of an exposed population, but are still believed to be within the realm of possible exposures. Potential routes by which individuals may be exposed to site-related contaminants are shown on Table 27. Potential pathways for current populations evaluated in the BRA include incidental ingestion of on-site surface soils for workers and trespassers and inhalation of chemicals volatilizing into basements of homes for residential populations. Future potential pathways evaluated in the BRA include ingestion of contaminated groundwater, dermal exposure to contaminated groundwater, inhalation of contaminated water while showering for residential populations and ingestion of sediment and dermal contact with sediment during recreational activities on the Yellowstone River. Table 28 shows routes for further evaluation. In identifying potential exposure pathways, both current and reasonably anticipated future land use at the site and surrounding area were considered. The site's proximity to the Yellowstone River suggests that recreational users may be exposed to contaminated sediment in the river. Past and current industrial use of the site suggests that current and future on-site workers may be exposed to contaminated surface soil. The close proximity of residential property suggests residents may be exposed to contaminated groundwater and indoor air and site trespassers may be exposed to contaminated soil.

Toxicity Assessment

The purpose of the toxicity assessment is to examine the potential for each COC to cause adverse effects in exposed individuals and to describe the relationship between the extent of exposure to a particular contaminant and adverse effects. Adverse effects include both carcinogenic and noncarcinogenic health effects in humans.

Toxicity criteria for carcinogens are slope factors in units of risk per milligram of chemical exposure per kilogram body weight per day ((mg/kg-day)). These cancer slope factors are based on the assumption that no threshold for carcinogenic effects exists and any dose, no matter how small, is associated with a finite cancer risk. Toxicity values for noncarcinogens, or for carcinogens that may also cause significant noncarcinogenic effects, are reference doses (RfDs) in units of milligrams of chemical exposure per mg/kg-day. RfDs are estimates of thresholds. Exposures less than the RfD are not expected to cause adverse effects even in the most sensitive populations with continuous exposure over a life time.

Table 29 shows carcinogenic and noncarcinogenic effects. A COC may be both a carcinogen and a noncarcinogen based on its adverse effects.

Risk Characterization

Chemical exposure estimates are combined with toxicity values to develop quantitative health risk estimates for exposure to BN Livingston Shop Complex COCs. Both cancer and noncancer health risks are estimated, as appropriate, for each significant exposure route identified. Risks from different exposure routes are combined to provide a total estimate of carcinogenic and noncarcinogenic health risks. Cancer and noncancer risks are summarized for each pathway in Table 29.

Carcinogens

For carcinogens, risks are estimated as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to the carcinogen. An excess lifetime cancer risk of 1×10^{-5} indicates that, as a reasonable maximum estimate, an individual has a 1 in 100,000 chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at the site.

The excess individual cancer risk is the additional chance that a person could develop cancer in his lifetime from being exposed to contaminated material. This risk is in addition to the risk for the general population of 1 in 3 chance or higher of developing cancer. Based on legislative directive, DEQ considers a 1×10^{-5} or lower excess cancer risk for known or suspected carcinogens as acceptable.[1] Cancer risks ranging from 1×10^{-4} to 1×10^{-6} are considered acceptable under CERCLA and the NCP, with 1×10^{-6} considered the point of departure.

The highest cancer risks estimated for the site are for potential future residents using groundwater for drinking, bathing and cooking. Cancer risks from drinking contaminated groundwater are estimated at 1×10^{-4} or a little greater than 1 in 10,000. Ingestion of contaminated groundwater containing tetrachloroethene contributes half of the aggregate cancer risk for this receptor population. Similar risks are estimated for dermal contact and inhalation while using contaminated groundwater while showering, bringing the total cancer risk for exposure to contaminated groundwater to 2×10^{-4}. Table 30 provides a summary of total cancer risks.

According to the BRA, current and potential future on-site workers have an increased incremental risk of cancer of 2×10^{-5} through ingestion of PAH contaminated surface

[1] Section 75-5-301(2)(b)(i), MCA.

soils. Risk estimates for ingestion of PAHs are based on the toxicity of benzo(a)pyrene. This approach considers the varying carcinogenic potency of PAHs. This risk calculation did not include the dermal exposure pathway. Dermal exposure would now be considered a standard pathway in this type of risk determination. Table 31 summarizes the cancer risks.

The BRA calculated the cancer risk in six individual homes where there was basement gas data that exceeded initial screening levels. Total cancer risks from exposure to VOC contaminated air in homes ranged from 2×10^{-6} to 2×10^{-5} for the low use scenario and from 3×10^{-6} to 2×10^{-5} for the high use scenario. Two homes exceeded the acceptable risk levels for both scenarios. Table 32 summarizes the cancer risks.

The total cancer risk with inhalation of basement air (high use scenario) for current residents is 2×10^{-5} and for future residents (also including exposure to contaminated groundwater) it is 3×10^{-4}. Inhalation of basement air accounts for the majority of the total potential risk for current residents and only a small percentage of the total potential risk for future residents. The total cancer risk without inhalation of basement air for current residents is 7×10^{-7} and for future residents it is 2×10^{-4}. DEQ believes that additional data are required to adequately evaluate the risks from inhalation of indoor air. The total cancer risk for current and future on-site workers is 2×10^{-5}.

Noncarcinogens

The potential for noncarcinogenic effects is evaluated by comparing an exposure level over a specified time period (e.g., a 70-year lifetime) with a reference dose derived for a similar exposure period for each noncarinogenic COC. Then cumulative toxic effects for combined exposures of multiple COCs are calculated. The ratio of exposure to reference dose is called a hazard quotient (HQ). The Hazard Index (HI) is calculated by adding the HQs for all COCs that affect the same target organ (e.g., liver) within a medium or across all media to which a given population that may reasonably be exposed.

Where the HI exceeds one, risks of noncancer effects may be elevated. Both EPA and DEQ consider a hazard index equal to or less than one for the human population, including sensitive subgroups, as protective. The highest noncancer risks are also associated with domestic use of contaminated groundwater. For small children (ages 1-6), the HI for ingestion of contaminants in groundwater approaches three. Table 33 summarizes these risks. Two homes were found to have HIs greater than one associated with inhalation of basement air (high use scenario). Table 34 summarizes these risks. The total HI for small children including ingestion of, dermal contact with, and vapor inhalation from contaminated groundwater is greater than thirteen. Table 29 summarizes these risks. For older children and adults, the HIs are six and four, respectively.

Additional Contaminants of Concern

Petroleum: Because petroleum products are a complex and highly variable mixture of hundreds of individual hydrocarbon compounds, characterizing the risks posed by petroleum contaminated soil and water has proven to be difficult and inexact. The BRA did not identify petroleum as a COC because at the time the BRA was conducted there was no established procedure by which to quantitatively evaluate risk from petroleum. There has been considerable development in recent years regarding the risk posed by petroleum contamination in soils and groundwater. Some constituents of petroleum products, including benzene and certain PAHs, have adequate toxicity information and are currently evaluated as individual COCs as they were in the BRA. However, focusing risk evaluation only on these indicator compounds cannot adequately characterize the risks posed by all the hydrocarbons present. The non-carcinogenic risks posed by non-target petroleum hydrocarbons to human health and the environment must also be evaluated. The Massachusetts Department of Environmental Protection (MADEP) and the Total Petroleum Hydrocarbon Criteria Working Group (TPHCWG) have each developed fraction/surrogate methods for evaluating the risks from these non-target petroleum mixtures (MADEP, October 1997 and TPHCWG, March 1998).

DEQ evaluated the MADEP and TPHCWG methods and, using the MADEP method, developed the Montana Risk-Based Corrective Action (RBCA) Tier I guidance that identifies screening levels for petroleum fractions and compounds in soil and groundwater. The screening levels consider risk to human health and leaching from soil to groundwater. RBCA uses environmental risk analysis, which incorporates elements of toxicology, hydrogeology, chemistry and engineering to assess the existing and potential risks from petroleum hydrocarbon contamination. Because RBCA Tier I screening levels are based upon conservative assumptions, DEQ considers them protective of human health and the environment. DEQ uses RBCA Tier I guidelines as screening levels to determine if additional evaluation is warranted at sites. If petroleum contamination exceeds the RBCA Tier I screening levels, then cleanup may be conducted to Tier I screening levels or further evaluation including site-specific risk assessment may be conducted.

Lead: According to the BRA, lead is known to cause toxic effects, including alterations in the hematopoietic and nervous systems. High doses of lead can produce damage to the kidneys, gastrointestinal tract, liver, and endocrine glands. In addition, exposure to lead that results in high blood lead levels can cause severe, irreversible brain damage, and possibly death.

The BRA identified lead as a COC in surface soil; however, exposure point concentrations for lead in soil for both commercial and trespasser scenarios were essentially the same as the 200 mg/kg default value used in the Integrated Exposure Uptake Biokinetic (IEUBK) Model for Lead in Children (EPA, February 1994). This

default concentration is meant to represent a plausible urban background and the model indicates that 200 mg/kg lead in soil does not result in unacceptable blood lead concentrations in children. The BRA concluded that trespassers and workers were not expected to receive significant lead exposure; therefore, it was not quantitatively evaluated in the BRA.

However, the potential exists that exposure point concentrations for lead in soil at C&P Packing will be significantly higher thereby posing an unacceptable risk to trespassers and workers. EPA's Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil (EPA, December 1996) and the associated Frequently Asked Questions on the Adult Lead Model Guidance Document (EPA, April 1999) provides a screening level of 750 mg/kg lead in commercial/industrial (i.e., non-residential) soils. EPA Region IX has also accepted this level as its Preliminary Remediation Goal (PRG) for lead in industrial soils (EPA, November 2000). DEQ believes this level is protective of human health.

Asbestos: Asbestos is a name commonly applied to a group of six different fibrous minerals (amosite, chrysotile, crocidolite, and the fibrous varieties of tremolite, actinolite, and anthophyllite). It is a mineral made up of long, thin fibers that appear somewhat similar to fiberglass. Asbestos fibers are very strong and resistant to heat and chemicals. Since the fibers are so resistant, they are also very stable in the environment. They do not evaporate into air or dissolve in water; however, pieces of fibers can enter the air and water from the weathering of natural deposits and the wearing down of man-made asbestos products. Asbestos is a known human carcinogen that causes lung cancer and mesothelioma. (Toxicological Profile for Asbestos, ATSDR December 1995).

D. Ecological Risk Assessment

The ecological risk assessment (ERA) evaluated potential adverse ecological effects of contaminated groundwater, surface water, sediment, and surface soil from the site. An important concern to community residents and groups such as Trout Unlimited was whether contamination from the BN Livingston Shop Complex affected fish and stream invertebrate populations in the Yellowstone River. Although samples obtained from river water and sediment both upstream and downstream from the site did not detect contamination directly related to the site, an investigation near the on-site WWTP outfall pipe did show contaminated river gravels. Test pits in river gravel near the outfall showed waste oil and VOC contamination. As discussed in the Section VI, approximately 50 yards of contaminated river gravel and sediment was removed from the Yellowstone River in 1990.

Receptors include major plant and animal species, both terrestrial and aquatic, that might be exposed to site contaminants. No rare, threatened, or endangered terrestrial or aquatic plant or animal species are reported near or make significant use of the site. However, the Yellowstone trout is considered a species of special concern by the state.

Although several inorganic and organic chemicals are detected in various media at the site, not all are found at concentrations that are cause for concern. The primary COCs identified in the ERA, based on frequency of detection, concentration, potential toxicity and bioaccumulation, include 4,4-DDE, aldrin, mercury and PAHs.

Overall risks posed to local ecological receptors are not unacceptable. The cumulative risks for surface water and surface soil COCs are low. The primary medium of concern from an ecological risk standpoint is Yellowstone River sediment. Contaminant concentrations in sediment can pose both a direct risk to benthic biota and an indirect risk to aquatic biota (because sediment serves as a potential source of surface water contamination) and to terrestrial biota (because of potential biomagnification of 4,4-DDE and possibly mercury).

VIII. DESCRIPTION OF ALTERNATIVES

A brief description of the site cleanup alternatives DEQ evaluated in the 1993 and 1994 FSs is set forth below. The soil and groundwater FS analyzed six soil and groundwater alternatives. The primary hydrocarbon FS analyzed seven diesel fuel alternatives. Each set of alternatives is examined separately. To distinguish between the soil and groundwater and diesel fuel alternatives DEQ has attached letters A through F to the diesel fuel remedies and 1 through 6 to the soil and groundwater remedies.

A. Soil and Groundwater Alternatives

Alternative 1 - No Action

The No Action alternative provides a baseline against which other options are compared. No further cleanup is considered under this action. For purposes of the FS and ROD, no action is defined as no further action as of September 19, 1998, the date of the proposed plan. Contamination would remain on-site and continue to affect soil and groundwater. Groundwater monitoring would continue. Groundwater monitoring costs for alternatives 1 through 6 include costs for diesel fuel monitoring. Typically, groundwater monitoring is considered an action and is not part of the no action alternative under CECRA.

Alternative 2 - Institutional Controls, Alternative Water Supplies, Asbestos Abatement, Possible In-Situ SVE

Institutional controls, which include controlled groundwater areas and covenants or deed restrictions on railyard property, would prohibit drilling water wells for domestic use on the BN Livingston Shop Complex and adjacent property where groundwater contains dissolved VOCs above cleanup levels. BNSF has already extended municipal water

distribution lines for groundwater users within a portion of the VOC plume. Existing in-situ SVE systems would be operated to achieve additional source removal, if necessary.

Visible asbestos would be removed from the cinder pile, soil would be sampled for asbestos and portions of the cinder pile that contain more than one percent asbestos would be covered with 24 inches of clean soil.

Alternative 3 – In-Situ SVE, Air Sparging, Institutional Controls and Asbestos Abatement

In-situ SVE and air sparging would be used to remediate source areas of VOCs to the groundwater. SVE and air sparging would remove VOCs from soil that contains VOCs above cleanup levels underneath the electric shop and transfer pit manway.

Alternative 3 also includes institutional controls and asbestos abatement actions described in alternative 2.

Alternative 4 - SVE, Air Sparging, Excavation and Ex-situ Soil Treatment, Institutional Controls and Asbestos Abatement

Under alternative 4, soil containing VOCs above soil cleanup levels would be excavated from around and beneath the electric shop, transfer pit manways and, if necessary, a portion of the cinder pile. Soil would be excavated and treated above ground on the BN Livingston Shop Complex or shipped off-site for disposal. Above ground treatment would include SVE within a contained cell to remove VOCs or later biological land treatment (land farming) to degrade any remaining petroleum hydrocarbons. In-situ SVE and air sparging would be used to remediate soil and groundwater at the electric shop.

Alternative 4 also includes the institutional controls and asbestos abatement actions described in alternative 2.

Alternative 5 - Groundwater Pumping and Ex-situ Treatment, In-Situ SVE, Institutional Controls and Asbestos Abatement

Under alternative 5 groundwater pump-and-treat systems would be installed at the electric shop and transfer pit manways. Groundwater would be pumped to the surface at these areas and treated to remove dissolved VOCs. After treatment, the water would be reinjected into upgradient injection wells. In-situ SVE systems would also be operated at the electric shop and transfer pit manways.

The free product diesel that contains chlorinated solvents and residual diesel fuel area is not suitable for pump-and-treat remediation at this time because the source of VOCs is in the petroleum smear zone near the water table. Groundwater pump-and-treat methods would not be used in this area because it could only recover dissolved VOCs

that are transferred from the smear zone to the groundwater and not remove the source of these VOCs.

Alternative 5 also includes the institutional controls and asbestos abatement actions described in alternative 2.

Alternative 6 (Modified Alternative 4) - Excavation and Ex-situ Soil Treatment, Institutional Controls and Asbestos Abatement, Possible In-Situ SVE

Alternative 6 is the DEQ preferred remedy for soil and groundwater from the proposed plan; it includes all technologies described in alternative 4 except air sparging. Soil beneath the vapor degreaser pit in the electric shop and around the transfer pit manway will be excavated and treated on-site to attain cleanup levels. If soil cleanup levels are exceeded at the locomotive shop manways, this soil will also be excavated and treated on site. Soil exceeding VOC cleanup levels in the cinder pile will also be excavated and treated to cleanup levels. Treated soil from excavations that does not meet on-site cleanup levels or regulatory requirements will be shipped off site for disposal. The existing SVE wells will be restarted and sampled after confirmation sampling to determine if additional soil contamination can be removed using existing in-situ SVE systems.

No active groundwater treatment is proposed under alternative 6. Studies conducted at the site indicate that air sparging groundwater in areas contaminated with chlorinated solvents produces vinyl chloride, a known human carcinogen, in groundwater. Therefore, alternative 6 may not clean up groundwater as quickly as alternative 4, but it will be more protective of human health. Institutional controls will prohibit the installation of groundwater wells and eliminate potential exposure to contaminated groundwater on land overlying the dissolved solvent plume. A groundwater monitoring program will be installed to continue to measure and confirm declining VOC concentrations.

The entire cinder pile will be recontoured, capped and revegetated whether or not it contains > 1% asbestos as described in alternative 2.

Additional basement gas samples, private groundwater wells and other necessary sampling will be performed.

B. Diesel Fuel Alternatives

The Diesel Fuel alternatives address free phase petroleum hydrocarbons (free product) on the water table. Residual hydrocarbons adsorbed to the soil are primarily discussed in the soil and groundwater alternatives.

Alternative A - No Action

The No Action alternative for diesel fuel provides a baseline against which other alternatives are compared. This alternative would allow diesel fuel to remain in place and degrade naturally. BNSF has estimated the time required for natural degradation is about 20 to 40 years or more for the thickest areas of diesel fuel. DEQ has estimated the time required for natural degradation to be greater than 100 years. For alternatives requiring more than 100 years, DEQ did not quantify recovery times. Diesel fuel would be monitored using the existing monitoring system to determine if floating diesel fuel is migrating and to measure the rate of degradation. No monitoring costs are shown for this alternative because they are included in monitoring costs for alternative 1 for soil and groundwater.

Alternative B - Intrinsic Bioremediation and Institutional Controls

Alternative B includes allowing the free product diesel fuel plume to biodegrade naturally without further product recovery. Institutional controls would be established to prevent human contact with the product during the degradation period. Institutional controls may include deed restrictions, restrictive covenants, a groundwater control area, and/or zoning restrictions prohibiting the installation of wells within the influence of the free product. BNSF has estimated the time required for natural degradation is about 20 to 40 years or more for the thickest areas of diesel fuel. DEQ has estimated the time required for natural degradation to be greater that 100 years.

Alternative C - Passive Recovery

Passive recovery would be used where diesel fuel can be recovered at rates greater than 0.10 gallon per day per well. Based on results from Test Cell 1, this would include the area where apparent diesel fuel thicknesses are greater than 0.25 foot, which includes an area of approximately 300,000 square feet. Up to 165 4-inch diameter recovery wells located on 40-foot centers would be installed in the area that contains apparent product thickness above 0.25 foot. Diesel fuel recovery from each well would be accomplished using a skimmer. Approximately 80 skimmers would be installed and operated in the area of thickest apparent diesel fuel. As recovery from wells decreases, the skimmers would be moved to other recovery wells within the diesel plume to maintain the total recovery rate. This alternative is estimated to recover 21,000 gallons of diesel fuel after 3 years. For comparison purposes, based upon the estimated volume of diesel fuel remaining (approximately 150,000 to 1,600,000 gallons) and the assumption that 30% of the release is recoverable, it would take 6.5 to 68.5 years to remove the diesel fuel.

Alternative D - Enhanced Two-Pump Recovery

Alternative D would involve recovery of diesel fuel with enhanced two-pump recovery systems. The enhanced recovery systems would recover diesel where recovery is the

most efficient. Two groundwater extraction systems are required because a portion of diesel fuel overlies the dissolved VOC plume in groundwater and requires water treatment before reinjection. Alternative D requires the existing multiple well recovery system to be modified and expanded by adding one recovery well to the east and three recovery wells to the west of the existing system. A trench would be used to reinject pumped groundwater into the aquifer.

Alternative D includes the installation of a recovery system and a groundwater injection trench (to the west) for diesel fuel recovery outside of VOC plume. This alternative involves installing one well in the existing recovery trench to replace the existing sump and a second well similar to the pilot-scale recovery wells.

The western recovery system, modified from the existent multiple well system, would not treat groundwater before reinjection. The eastern recovery system, modified from the existent multiple well system, would utilize the pilot-scale treatment system for treating groundwater before reinjection. This alternative is estimated to recover 17,000 gallons of diesel fuel after 3 years. For comparison purposes, based upon the estimated volume of diesel fuel remaining (approximately 150,000 to 1,600,000 gallons) and the assumption that 30% of the release is recoverable, it would take 8 to 85 years to remove the diesel fuel.

Alternative E - Passive Recovery of Diesel Fuel Containing VOCs

Under this alternative, passive diesel fuel recovery would be conducted throughout the northeastern area where diesel fuel containing VOCs is located. The objective of alternative E would be to remove VOCs from diesel fuel.

Up to 22 passive recovery wells would be located within the area of diesel fuel that contains VOCs. The new recovery wells would be installed on 100-foot centers. Well placement and construction would be similar to that of alternative C. Existing observation and recovery wells within the area of diesel fuel containing VOCs would be used in this alternative. Diesel fuel thickness in this area is generally less than 0.10 foot.

Alternative E focuses on cleaning up the northeast portion of diesel fuel, which contains VOCs; no attempt to recover diesel fuel elsewhere would be made. This alternative is estimated to recover 1,600 gallons of diesel fuel after 3 years. Since this alternative only addresses a small area of the diesel fuel plume, approximately 43,000 to 478,000 gallons of diesel fuel estimated to be available for recovery would remain.

Alternative F - Bioventing and Passive Recovery

Alternative F combines bioventing with passive skimming of diesel fuel. This alternative is designed to remove diesel fuel from the center of the plume by skimming diesel fuel off the surface of the groundwater. This alternative also increases the oxygen

concentration in the smear zone, through bioventing, while recovering diesel fuel through passive recovery from the south side of the plume along Park Street.

Wells would be installed along track 4 and south of the transfer table. Two new passive recovery wells would be installed between the mainline and Park Street and south of the MRL locomotive shop. Monitoring wells would be installed to monitor diesel fuel along Park Street and the leading edge of the plume.

In the FS, alternative F focuses on bioventing to remove diesel fuel in the thickest part of the plume. While bioventing is acceptable for remediating residual diesel fuel in soil, bioventing is not an acceptable technology to recover free product (diesel fuel). The conceptual use of bioventing to remove diesel fuel inappropriately assumes biodegradation occurs within diesel fuel when present as floating product. This alternative was retained because bioventing is effective in remediating residual diesel fuel. This alternative is estimated to recover 2,000 gallons of diesel fuel in 5 years.

Modified Alternative F - Expanded Passive Recovery, Monitoring and Bioventing

This is DEQ's preferred remedy for diesel fuel from the proposed plan. This alternative is similar to alternative F, but increases the number of passive recovery and bioventing wells to cover a larger area. It is also proposed in phases, which will allow for evaluation of various techniques in order to maximize diesel fuel recovery. The length of time over which recovery will occur is at least 6 years. This alternative will place more passive recovery wells in areas where diesel fuel is the thickest and in areas where the risk of worker injury would be lessened. These areas are along abandoned track 4 and Park Street, the MRL tunnel, in front of MRL shops and in existent recovery wells. During Phase I, diesel fuel recovery will take place for 2 to 3 years until sufficient information is obtained to design Phase II. DEQ will determine if residual diesel fuel will require additional evaluation and remediation. Phase II will probably require the installation of additional wells.

This alternative will also place more bioventing wells around the perimeter of the diesel plume in order to enhance biodegradation of residual diesel fuel adsorbed to soil. The perimeter of the diesel plume is an appropriate area for biodegradation because only residual diesel fuel with little or no free product remains in this area.

This alternative will also increase the number of monitoring wells south and east of the diesel plume to ensure the plume is not moving and to document that concentrations of diesel fuel constituents are decreasing in groundwater.

Under this alternative, Phase I and Phase II free product recovery will occur for at least 6 years and bioventing will occur for approximately 10 years. This alternative is estimated to recover 10,000 gallons of diesel fuel after 6 years only operating Phase I wells. However, recovery is anticipated to be greater since more wells are located in the thickest diesel fuel area and Phase II should add additional recovery wells.

IX. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The soil and groundwater and diesel fuel alternatives were evaluated and compared against the eight criteria listed below. The first two criteria are threshold criteria that must be met for any remedy. The five primary balancing criteria are those criteria which must be weighed and evaluated to select the best overall remedy for the site. The community acceptance criteria is a modifying criteria based on whether or not the community as a whole supports, has reservations about, or opposes a remedy. The reader should refer to Table 35 Comparison of Alternatives Using Eight Criteria for a comparative analysis summary.

A. Threshold Criteria

1) Overall protection of human health and the environment addresses whether an alternative provides adequate protection in both the short-term and the long-term from unacceptable risks posed by hazardous substances, pollutants or contaminants present at the site by eliminating, reducing, or controlling exposure to protective levels.

2) Compliance with environmental requirements, criteria and limitations (ERCLs) addresses whether an alternative will comply with applicable and well-suited requirements under federal and state environmental laws and regulations.

B. Primary Balancing Criteria

3) Long-term effectiveness and permanence refers to the ability of an alternative to maintain reliable protection of human health and the environment over time.

4) Reduction of toxicity, mobility and volume through treatment refers to the degree that the alternative reduces toxicity, mobility and volume of contamination.

5) Short-term effectiveness addresses the period of time needed to complete the alternative and any adverse impact on the community, workers, or the environment during the construction and implementation period.

6) Implementability refers to the technical and administrative feasibility of an alternative including the availability of materials and services needed to carry out a particular option.

7) Cost evaluates the estimated capital costs and operation and maintenance costs based on the present worth of each remedy for a specific time period.

C. Modifying Criteria

8) Community Acceptance is based on whether or not the community was a whole supports, has reservations about, or opposes a remedy.

The BN Livingston Shop Complex is being cleaned up pursuant to CECRA. The Montana legislature has modified certain areas of CECRA cleanup requirements in the 1995 and 1999 legislative sessions. However, due to a legislative savings clause, the changes do not apply to the BN Livingston Shop Complex cleanup. DEQ must therefore select and implement the remedy pursuant to CECRA as amended in 1991.

CECRA is modeled after the federal Superfund law (CERCLA). In 1991 CECRA was very similar to the federal CERCLA. Because of this similarity in the laws, DEQ relied on the criteria developed under the federal CERCLA in its implementation of the original CECRA. Also, in the 1990 consent decree with BNSF, DEQ committed to draw on CERCLA and its implementing regulations in the selection of a remedy for the BN Livingston Shop Complex. Therefore, the cleanup alternatives are evaluated based on the federal Superfund criteria. These criteria are similar to the FS criteria identified in the 1990 consent decree.

D. Soil and Groundwater Alternatives Evaluation

1) Overall Protection of Human Health and the Environment

Alternative 1 would not provide adequate protection to human health and the environment in the short-term and long-term, because the source of groundwater contamination still remains and continues to leach to groundwater and exposure to asbestos in the cinder pile is not addressed. Alternative 2 would protect public health in the short-term by reducing exposure to dissolved VOCs in groundwater through the implementation of ICs, but would not be protective in the long-term because the source of groundwater contamination still remains and continues to leach to groundwater. If all the cinder pile is capped, then exposure to asbestos is addressed. Alternatives 3, 4, 5 and 6 would all be protective of human health and the environment. Alternative 3 would protect public health in the short-term by reducing exposure to dissolved VOCs in groundwater through the implementation of ICs. Alternative 3 is also protective in the long-term because the source of groundwater contamination is removed, thus shortening the time for groundwater to reach cleanup levels. If all the cinder pile is capped, then exposure to asbestos is addressed. Alternative 4 would protect public health in the short-term by reducing exposure to dissolved VOCs in groundwater through implementation of ICs. Alternative 4 is also protective in the long-term because the source of groundwater contamination is removed. It is more protective than

Alternative 3 because it provides for groundwater to reach cleanup levels in a shorter time frame than Alternative 3. However, there is a concern that air sparging may increase the toxicity of contamination by creating vinyl chloride in the groundwater, which may make this alternative less protective. If all the cinder pile is capped, then exposure to asbestos is addressed. Alternative 5 would protect public health in the short-term by reducing exposure to dissolved VOCs in groundwater through implementation of ICs. Alternative 5 is also protective in the long-term because it removes contamination from the groundwater, but does not remove the source of groundwater contamination. If all the cinder pile is capped, then exposure to asbestos is addressed. Alternative 6 is the same as Alternative 4 with the exception of air sparging, and therefore is equally as protective.

2) Compliance with Environmental Requirements Criteria Limitations (ERCLs)

In the FS, Alternative 1 is expected to reach groundwater cleanup levels in 70 years. However, when compared to other alternatives FS, this is not a reasonable time frame for the chlorinated solvents; therefore, the no action alternative does not meet ERCLs. It also does not meet ERCLs for asbestos in the cinder pile. In the FS, Alternative 2 is expected to reach groundwater cleanup levels in 70 years. However, this is not a reasonable timeframe for chlorinated solvents when compared to other alternatives in the FS; therefore, alternative 2 does not meet ERCLs. If the entire cinder pile is capped, then it would meet asbestos ERCLs. Alternatives 3 and 4 would meet ERCLs for groundwater if air sparging was not implemented in areas of vinyl chloride concern. If the entire cinder pile is capped, then it would meet asbestos ERCLs. Alternative 5 does not remove the source of VOCs and ERCLs will not be met in the source area within a reasonable timeframe compared to other alternatives in the FS. Alternative 6 is equal in its compliance with ERCLs as Alternative 4 without the vinyl chloride concerns, which may lead to non-compliance with groundwater ERCLs. Alternative 1 would not comply with ERCLs because no cleanup would occur; neither air quality standards nor water quality standards would be attained. Alternative 2 would not treat groundwater to required water quality standards. Alternative 3 and 4 would meet ERCLs for groundwater. Alternative 5 would not comply with ERCLs for groundwater within a reasonable time when compared to other alternatives in the FS because all sources of contamination would not be removed, thus leaching contamination to groundwater for many years. ERCLs would not be achieved for the cinder pile under alternative 1. Alternatives 2, 3, 4 and 5 may comply with ERCLs associated with asbestos and solid waste only if the entire pile is capped. However, if portions remain uncapped, ERCLs will not be met. Alternative 6 will comply with ERCLs for contamination in all media including groundwater, soil and air.

3) Long-Term Effectiveness and Permanence

Alternative 1 would not provide long-term effectiveness and is not permanent because no cleanup would occur. Alternative 2 provides poor permanence and long-term solutions for cleaning up groundwater because of the poor reliability of institutional

controls as the sole remedy. However, it would provide some degree of long-term protectiveness for the cinder pile if the entire cinder pile is covered with clean soil. Alternative 3 provides long-term effectiveness and permanence by cleaning up groundwater through source removal. With respect to asbestos, it has the same degree of effectiveness and permanence as alternative 2. In the FS alternative 4 provide the most long-term effectiveness and permanence; however, vinyl chloride may be generated through air sparging, thereby reducing long-term effectiveness. Alternative 5 offers fair long-term effectiveness and permanence, but at some point the effectiveness of treatment of contaminants diminishes. Alternative 6 provides the same level of permanence and long-term effectiveness as alternative 4, with the exception of vinyl chloride.

4) Reduction in Toxicity, Mobility and Volume

As the no action alternative, Alternative 1 would not reduce the toxicity, mobility or volume of contamination. Institutional controls under Alternative 2 would not reduce the toxicity, mobility and volume of VOCs in groundwater, but SVE would reduce the volume of VOCs in soil and capping of the entire cinder pile would reduce mobility of asbestos. SVE and air sparging under Alternative 3 would reduce the volume of VOCs in soil and groundwater in source areas. Excavation of VOC source areas under Alternative 4 offers an immediate reduction in mobility of VOCs; however, air sparging could increase toxicity if vinyl chloride is generated. Capping the entire cinder pile would reduce mobility of asbestos. The groundwater pump and treat system in alternative 5 would reduce the volume of VOCs in groundwater. SVE would reduce the volume of VOCs in soil and capping the entire cinder pile would reduce mobility of asbestos. Alternative 6 provide the same reductions as Alternative 4 without the potential generation of vinyl chloride.

5) Short-Term Effectivenes

Alternative 1 would not present a risk to the community during implementation because no construction would occur. Alternative 2 would present a limited risk to workers due to installation of an SVE system and operation of heavy equipment to cap the entire cinder pile. These risks could be minimized by following the proper safety procedures to protect the community and remediation workers by wetting the cinder pile. Alternative 3 would present a limited risk to workers due to installation of SVE and air sparging systems and operation of heavy equipment to cap the entire cinder pile. These risks could be minimized by following the proper safety procedures to protect the community and remediation workers, and by wetting the cinder pile. Alternative 4 would present a greater risk to workers than alternatives 2 and 3 due to installation of SVE and air sparging systems, excavation of contaminated soils, and operation of heavy equipment to cap the entire cinder pile. These risks could be minimized by following the proper safety procedures to protect the community and remediation workers, and by wetting the cinder pile. Alternative 5 would present the same risks posed by alternatives 2 and 3. Alternative 6 would present the same risks as alternative 4. The

risk to the community is minimal for alternatives 2 through 6 and can be properly mitigated. Although an active railyard increases short-term risks to workers, this can be mitigated with proper safety precautions as demonstrated through the earlier interim actions at the site.

6) Implementability

Alternative 1 is easily implemented. Alternative 2 would require administrative time to properly record and file institutional controls. Equipment is locally available and the services of environmental contractors are available to cap the entire cinder pile with soil. Alternatives 2, 3, 4, 5 and 6 are all implementable and the materials and services needed to carry out these options are readily available.

7) Costs

As shown on Table 36, costs to implement soil and groundwater alternatives range from $501,000 for alternative 1 (groundwater monitoring would be performed under the no action alternative and monitoring for diesel fuel is also included in this cost) to $1,495,734 for alternative 6. Costs for alternatives 1, 2 and 3 are similar and range between $501,000 and $776,000. The costs for alternatives 4 and 5 are similar, ranging from $1,170,000 to $1,065,000. The cost of alternative 6 is the most costly alternative because it includes operation and maintenance costs for capping the entire cinder pile. Costs for capping the entire cinder pile are not included in cost estimates for alternatives 1 through 5. Based on public comment, DEQ re-evaluated the cost for alternative 6. That information is provided in Section X of the ROD.

8) Community Acceptance

Thirteen commenters provided input during the public comment period. One set of comments was submitted after public comment period closed; however, DEQ considered and responded to the comments. Seven commentors supported removing and treating contaminated soils near the electric shop and transfer pit manways. Two commenters supported recapping the cinder pile and three other commenters supported removal and off-site disposal of the cinder pile. Two commenters did not believe the cinder pile poses a risk, but proposed recontouring and some capping of the pile. Seven commenters supported private well sampling and indoor air sampling in homes. One commenter expressed concern about being able to distinguish site contamination from other potential sources. One commenter supported ICs. The following issues were also raised: concern about industrial solvents being used at residential homes; availability of funds for technical assistance to the community; safety of on-site workers; air and noise impacts from current railyard activities; and timeliness of cleanup. The community's response to the proposed remedy is generally favorable. Discussion of removing the cinder pile is incorporated in DEQ's Response Summary.

E. Diesel Fuel Alternatives Evaluation

1) Overall Protection of Human Health and the Environment

Alternatives C, D and modified alternative F provide overall protection of human health and the environment because diesel fuel would be removed from the aquifer over a larger area. Modified alternative F provides for better protection by also addressing diesel fuel in soils. By removing free-product diesel, the source of dissolved diesel in the groundwater is removed, thus enhancing natural degradation of the dissolved diesel in the groundwater and residual diesel in the soil. Alternatives A, B, E and F are not expected to provide adequate protection of public health and the environment because Alternatives A and B do not actively remove the source of contamination and Alternatives E and F cover a substantially smaller area.

2) Compliance with Environmental Requirements, Criteria and Limitations (ERCLs)

Alternatives C, D and modified alternative F will meet ERCLs because free product would be removed from groundwater to the maximum extent practicable. Alternative E would remove VOCs and a small volume of diesel fuel in the northeast portion of the diesel plume but would not comply with ERCLs because diesel fuel would not be removed in the thickest part of the plume. Alternatives A and B would not comply with ERCLs because no attempt would be made to recover diesel fuel. Alternative F does not meet ERCLs due to the limited area of recovery.

3) Long-term Effectiveness and Permanence

Alternatives C, D and modified alternative F will provide long-term effective and permanent solutions for diesel fuel. Alternatives C and modified alternative F, with more wells and better coverage over the diesel contaminated area, will be more effective than Alternative D. Alternatives A, B and E would not be as effective over the long-term compared to alternatives C, D and modified alternative F because the source of contamination is not removed. Alternative F would provide some long-term effectiveness and permanence for passive recovery in a limited area. Modified alternative F will remove both free product using skimming technologies and residual diesel fuel using bioventing to address contamination in soil over a larger area. Alternatives C and D would not remove residual diesel fuel adsorbed to soil.

4) Reduction in Toxicity, Mobility and Volume

Alternatives C, D and modified alternative F recover the greatest volume of diesel fuel from groundwater and therefore provide the greatest reduction in toxicity, mobility and volume compared to Alternatives A, B and E. Modified alternative F will also remove residual diesel fuel from the subsurface through bioventing. Alternative E and F would reduce a lesser volume of diesel fuel on the water table. Alternatives A and B would not actively remove any diesel fuel from the aquifer.

5) Short-term Effectiveness

Alternatives C, D, F and Modified Alternative F present a potential for injury to workers during construction of the diesel recovery system in the active railyard, but utilizing safe work practices and employing a railyard spotter to control locomotive and train traffic during construction would greatly reduce the chance of accidents. Alternative E would present less potential injury to workers because this area is mostly outside active train tracks. Since Alternatives A and B do not include construction of diesel recovery systems there would be no short-term impacts on worker safety.

6) Implementability

Alternative A is easily implemented because it is the no action alternative. Alternative B would require additional administrative efforts to implement institutional controls. Alternatives C, D, E, F and modified alternative F are implementable as demonstrated at other sites. Materials and services needed to carry out these options are available locally, except for specialized drilling equipment, as discussed in the selected remedy section. However, many wells are already in place to carry out modified alternative F, as well as alternatives E and F.

7) Cost

As shown on Table 37, alternative A requires no action and no cost. Alternative B would cost about $124,387 to implement institutional controls and perform routine monitoring. Alternative E would cost about $245,014 to install the recovery well network and perform operation and maintenance on the system for three years. Alternative C, (passive recovery), is one of the most costly systems to install and operate ($869,673) if 165 recovery wells are installed. Alternative D would cost about $650,791 and alternative F about $493,545. Modified alternative F is the most costly alternative to implement at $1,010,694. However, costs for modified alternative F were calculated by DEQ with more assumptions than the costs for all other alternatives provided by BNSF in the FS, so these costs may not be strictly comparable. Based on public comment, DEQ re-evaluated the cost for alternative F. That information is provided in Section X of the ROD.

8) Community Acceptance

Four commenters supported free-product recovery, but some expressed concerns that it would not be 100% effective and that there were safety concerns associated with the free-product recovery and bioventing. One commenter suggested surfactants be used at the site instead of bioventing. One commenter only expressed safety concerns. Two other commenters disagreed with free-product recovery. One commenter wanted the site cleaned up to pristine conditions. The community's response to the proposed

remedy is generally favorable if safety concerns are addressed. Discussion of utilizing surfactants is incorporated in DEQ's Response Summary.

X. SELECTED REMEDY

A. Summary of the Rationale for the Selected Remedy

This section presents the selected remedy for the BN Livingston Shop Complex. In compliance with CECRA's requirements, and consistent with CERCLA and the NCP to the extent practicable, and with consideration of public comments received, DEQ has determined that the Preferred Alternatives set forth in the Proposed Plan, with limited modifications as outlined below, comprise the appropriate remedy for site.

As presented here, the selected remedy will attain a degree of cleanup of the hazardous or deleterious substance and control of a threatened release or further release of that substance that assures protection of public health, safety, and welfare and of the environment. The selected remedy will meet applicable state or federal environmental requirements, criteria, or limitations and substantive state or federal environmental requirements, criteria, or limitations that are well suited to site conditions.

In addition, the selected remedy protects public health, safety and welfare and the environment, uses permanent solutions, uses alternative treatment technologies or resource recovery technologies to the maximum extent practicable, and is cost-effective, taking into account the total short- and long-term costs of the actions, including operations and maintenance activities for the entire period during which the activities will be required. While certain other alternatives may better satisfy certain individual selection criteria, the selected remedy best meets the entire range of statutory criteria and in addition complies with all the requirements of CECRA.

In addition, although not required by statute to do so (due to the savings clause), the selected remedy also complies with CECRA remedy requirements as enacted by the legislature through 2001. The selected remedy will attain a degree of cleanup of the hazardous or deleterious substance and control of a threatened release or further release of that substance that assures protection of public health, safety, and welfare and of the environment. The selected remedy will meet applicable state or federal environmental requirements, criteria, or limitations and substantive state or federal environmental requirements, criteria, or limitations that are relevant to site conditions.

The selected remedy, considering present and reasonably anticipated future uses, and giving due considerations to institutional controls, demonstrates acceptable mitigation of exposure to risks to the public health, safety, and welfare and the environment, is effective and reliable in the short term and the long term is technically practicable and implementable, uses treatment technologies or resource recovery technologies if

practicable, giving due consideration to engineering controls, and is cost-effective.[2] As discussed in the ROD, the selected remedy is acceptable to the majority of the affected community, as indicated by community members and the local government.

B. Summary of the Selected Remedy

The remedy requires each media that contains COCs to meet the cleanup levels prescribed in the ROD. Cleanup levels are set forth in Table 1.

The selected remedy is comprised primarily of sixteen components as set forth below. Interim actions have been evaluated in the FSs and Proposed Plan and are considered part of the selected remedy.

- VOC-contaminated sludge: The selected remedy is source removal of sludge and off-site disposal at a licensed subtitle C facility. All known sludge has been properly disposed off-site.

- VOC-contaminated soils: The selected remedy is treatment of soils to below cleanup levels, either in-situ or ex-situ. Ex-situ treated soils with contaminant concentrations below cleanup levels may be disposed of within the site at an approved location, in compliance with ERCLs. All soils that are technically impracticable to treat to below cleanup levels must be properly disposed off-site in compliance with all laws. With the exception of the transfer pit manways and locomotive shop manways, all known VOC-contaminated soils have now been excavated and are currently being treated.

- PAH-contaminated soils: The selected remedy will be evaluation of cleanup alternatives followed by implementation of an approved remedial action that will achieve cleanup levels.

- Petroleum-contaminated subsurface soils, including PAHs: The selected remedy is installation and operation of bioventing wells until cleanup levels are achieved and maintained.

- Petroleum-contaminated surface soils: The selected remedy will be evaluation of cleanup alternatives followed by implementation of an approved remedial action that will achieve cleanup levels.

[2] Under 75-10-721, MCA (1999), cost-effectiveness is determined through an analysis of incremental costs and incremental risk reduction and other benefits of alternatives considered, taking into account the total anticipated short-term and long-term costs of remedial action alternatives considered, including the total anticipated cost of operation and maintenance activities.

- Lead-contaminated soils: The selected remedy will be evaluation of alternatives followed by implementation of an approved remedial action that will achieve cleanup levels, should lead contamination be confirmed on-site.

- Asbestos-contaminated soils and debris: The selected remedy relies on containment, fencing, and restrictive covenants.

- Contaminated residue: Contaminated residue remaining from any interim action will be properly disposed of in compliance with all environmental laws.

- VOC-contaminated groundwater: The selected remedy is source removal of VOC-contaminated sludge and soils (as set forth above) followed by monitored natural attenuation to meet cleanup levels within a reasonable time (twenty years). A contingency remedy requires active groundwater treatment in source areas using localized pump-and-treat systems if cleanup levels will not be met within twenty years under the natural attenuation remedy.

- Lead-contaminated groundwater: The selected remedy will be evaluation of cleanup alternatives followed by implementation of an approved remedial action that will achieve cleanup levels.

- Free product on groundwater: The selected remedy is source removal throughout the diesel plumes of the free product to the cleanup level.

- Dissolved phase petroleum in groundwater, including PAHs: The selected remedy is source removal of the free product and bioventing of petroleum-contaminated subsurface soils to the cleanup levels followed by MNA for the dissolved phase to meet cleanup levels within a reasonable time (twenty years). A contingency remedy will be required if cleanup levels will not be met within twenty years under the natural attenuation remedy.

- Indoor air / basement gas: The selected remedy is installation and operation of removal systems to meet cleanup levels.

- Expanded sampling and confirmation sampling.

- Monitoring and maintenance until all cleanup levels are reached.

- Reliance on Institutional Controls.

C. Components of the Selected Remedy

Sludge

RCRA generally defines sludge as any solid, semi-solid, or liquid waste generated from an industrial wastewater treatment plant, exclusive of the treated effluent. The interim actions that led to sludge removal are consistent with the final remedy. Removal of sludge is leading to a substantial decrease in groundwater contaminant concentrations. If any additional sludge is discovered on-site in the future, it will be removed and disposed of off-site consistent with the interim action and in compliance with all laws.

Contaminated Soil

VOC Contaminated Soil

The selected remedy is to treat all VOC contaminated soils to below cleanup levels. VOC contaminated soils at this site are treatable through conventional technologies. Both in-situ and ex-situ SVE has shown to be effective at reducing contaminant concentrations in soil to cleanup levels. Treatment of soils to cleanup levels is leading to a substantial decrease in groundwater contaminant concentrations.

At the release of the Proposed Plan, contaminated soil remained beneath the vapor degreaser pit at the electric shop and transfer pit manway and locomotive shop manway. This was the largest known remaining source of VOC contamination to groundwater. The soil from the electric shop has since been excavated pursuant to an approved interim action work plan and is presently being treated ex-situ. Transfer pit manway and locomotive shop manway soil await final disposition. Once soils are treated to cleanup levels, they may be placed on-site in an appropriate location. Since backfilling has already been completed, the soils can no longer be returned to the electric shop area and an evaluation of disposal locations must be performed and a site selected that complies with all ERCLs and is protective of human health and the environment. Any VOC contaminated soils subsequently discovered to be above cleanup levels will also need to be treated.

PAH Contaminated Surface Soil

PAH contaminated surface soil in the railyard poses an unacceptable risk to on-site workers. However, this contaminant was not addressed in the FS or Proposed Plan. As part of remedial design, an analysis of alternatives to remediate soil exceeding PAH cleanup levels will be conducted. Public input will be solicited and the DEQ selected alternative will be implemented as part of this remedial action.

Petroleum Contaminated Subsurface Soils

The selected remedy is installation and operation of bioventing wells until cleanup levels are achieved and maintained. During Phase I of the free product removal described below, petroleum contaminated subsurface soils in the railyard will be addressed through the installation of twelve bioventing wells. The effectiveness of bioventing will be evaluated in Phase I by collecting soil samples for EPH, including PAHs, and conducting respiration tests or other appropriate methods. If bioventing is found to be ineffective, other remedial options will be evaluated for Phase II. The locations of the Phase I bioventing wells are set forth in Figure 7. Phase II may require subsequent wells in order to meet cleanup levels site-wide. If any petroleum contaminated soils are found outside of the railyard, other alternatives including land farming can be evaluated, in addition to bioventing wells.

Petroleum contaminated soils will be treated to meet RBCA Tier 1 guidelines for subsurface soils or an alternate DEQ-approved cleanup level. Treatment of soils to cleanup levels is expected to provide a decrease in groundwater contaminant concentrations.

Petroleum Contaminated Surface Soils

Petroleum contamination in surface soil was not identified as a contaminant of concern for the site in the RI. Surface soil samples were not analyzed for petroleum compounds during the RI. At the time, there was no method to quantitatively evaluate risks from petroleum contaminated soils. However, methods are now available and DEQ has determined that petroleum contamination in soils at certain levels poses an unacceptable risk to human health and the environment as presented in RBCA Tier 1 guidelines for surface soils. As part of the remedial design, the nature and extent of this potential source will be determined and any surface soil exceeding RBCA Tier 1 levels or an alternate DEQ-approved cleanup level will be remediated. Cleanup alternatives will be evaluated as part of the remedial design. Public input will be solicited and the DEQ selected alternative will be implemented as part of the remedial action.

Lead Contaminated Soil

The BRA did not quantitatively evaluate the risk from lead in surface or subsurface soils. Since the proposed plan, new information indicates the potential for elevated lead levels on-site (C&P Packing property) that exceed the EPA's recommended screening level of 750 ppm for industrial soils. As part of remedial design, the nature and extent of this potential source will be determined and any on-site soil exceeding the 750 ppm level or an alternate DEQ-approved site-specific cleanup level will be remediated. Cleanup alternatives will be evaluated as part of the remedial design. Public input will be solicited and the DEQ selected alternative will be implemented as part of the remedial action.

Asbestos Contaminated Soil and Debris

Solid wastes and asbestos have been identified in the cinder pile. The selected remedy for the cinder pile is a cap consisting of 18 inches of clean fill and 6 inches of top soil, over the entire cinder pile which will be successfully revegetated. Some regrading may be necessary. In addition, the cinder pile will be fenced to restrict access and restrictive covenants will be applied in order to maintain the integrity of the cap.

For asbestos found outside of the cinder pile at levels greater than one percent, remediation alternatives must be considered and the asbestos remediated. All other solid waste (including hazardous waste other than media) must be removed, treated if practicable, and properly disposed off-site.

Contaminated Residue

Contaminated residue remaining from any interim action will be properly disposed of in compliance with all environmental laws. DEQ notes concrete debris from the vapor degreaser pit PCE-contaminated backfill interim action still remains onsite. It is unclear whether the concrete was treated pursuant to hazardous waste regulations.

Contaminated Groundwater

VOC Contaminated Groundwater

Since all the known sources of VOC contamination to groundwater will be remediated as part of the remedial action, the selected remedy for VOC contaminated groundwater includes monitored natural attenuation. The cleanup levels for VOCs in groundwater are shown on Table 1 and are the state's WQB-7 levels.

Monitored natural attenuation of chlorinated VOCs is suspected to be occurring. Collecting natural attenuation parameters would confirm whether it is occurring. A quarterly groundwater monitoring program will measure and confirm declining VOC concentrations. After 3 years, groundwater monitoring data will be evaluated to determine if localized active groundwater treatment is necessary. If monitoring data after 3 years indicates cleanup levels will not be met in 20 years, active groundwater treatment in source areas using localized pump-and-treat systems will be implemented as part of the remedial action.

Lead Contaminated Groundwater

The BRA did not identify lead as a contaminant of concern in groundwater for the site. During the RI, the maximum contaminant level (MCL) for lead in drinking water was 50 ug/L. Since that time, the MCL was revised to 15 ug/L and a WQB-7 standard of 15 ug/L was established. Based upon these revisions, lead exceeds standards in the groundwater in some portions of the plumes. As part of remedial design the nature and

extent of lead contamination in groundwater will be determined and groundwater exceeding standards will be remediated. Cleanup alternatives will be evaluated as part of the remedial design. Public input will be solicited and the DEQ selected alternative will be implemented as part of the remedial action.

Petroleum Contaminated Groundwater

Free-Product: The selected remedy for free product is removal of free product to the maximum extent practicable. This means removing free product until a threshold thickness of 1/8 inch or less of free product is present over a 2 year, quarterly monitoring period. Free product recovery will be implemented in two phases. Figure 7 identifies the location of new and existing free product recovery wells. As part of Phase I, new monitoring wells will be installed to confirm the presence and thickness of free product within the presumed free product plume. Upon confirming the presence of free product, 40 new recovery wells will be installed. Previous treatability studies were not performed in a manner that would lead to recovery of free product to the maximum extent practicable. Advances in technology (including vacuum-enhanced recovery) associated with the highly transmissive nature of this aquifer should provide optimum free product recovery. The remedial design will provide a required framework for installation, operation, and maintenance of the recovery wells. DEQ expects reprocessing of removed diesel. In consideration of the ongoing operations in an active railyard (including remediation and railyard worker safety), the recovery wells associated with Phase I will be located with as little impact on ongoing operations as necessary. As part of remedial design, the structural stability of the MRL tunnel will be evaluated. Safety measures will be employed, which will further reduce the impacts to on-site workers.

Phase I will operate for 2-3 years. During that time, sufficient information will be obtained to design a permanent and cost-effective Phase II recovery system. Phase II will require recovery of free product throughout the entire plume to the cleanup level, relying on information gained in Phase I and new technology advances.

Dissolved Phase Petroleum: The selected remedy for dissolved phase petroleum is monitored natural attenuation coupled with free product and subsurface soil remediation described above. A groundwater monitoring program will measure and evaluate natural attenuation. Confirmation sampling will be performed at the depot plume to confirm no free product remains. Three years of monitoring data will be collected from the depot plume and the freight train refueling plume once free product has met cleanup levels and natural attenuation will be re-evaluated. If natural attenuation does not appear to degrade contaminants within a reasonable time frame (20 years) to WQB-7 levels or beneficial uses, alternate remedies will be evaluated and a DEQ-approved remedy will be implemented after free product cleanup levels have been met.

Basement Gas

Basement gas (indoor air) sampling at representative homes within the VOC plume will be implemented to determine if residences or businesses have levels of VOCs above EPA Region IX PRGs screening levels for ambient air. If results exceed screening levels, then sampling will be expanded as appropriate and site-specific cleanup levels will be calculated for indoor air based on the BRA with one modification for exposure time. All residences and businesses with basement gas levels above site-specific cleanup levels for indoor air will have a removal system installed at no cost to the owner. In order to remain protective, these systems will be maintained until cleanup levels are continually met without operation of the system. In addition, confirmation basement gas sampling will be performed at locations NE-1, NE-2, NE-3, NE-4, NE-5, SE-1, SE-2, SE-5.

D. Expanded Sampling and Confirmation Sampling

The nature and extent of petroleum contamination in soils and groundwater and lead contamination in soils and groundwater will be determined based on a DEQ-approved sampling and analysis plan. In addition, previously completed confirmation sampling will be reviewed and additional sampling will be performed if necessary, at all interim action locations and the locations of other remedial actions. Upon completion of each remedial action, samples will be taken to confirm cleanup levels have been achieved. If confirmation samples indicate exceedances of cleanup levels, then additional measures will be taken consistent with the remedy in order to meet cleanup levels. For VOC contaminated media this may include restarting the existing SVE wells located in the interim action area and sampling to determine if additional soil contamination can be removed using existing in-situ SVE systems.

E. Monitoring and Maintenance

Monitoring and maintenance will be on-going for all actions where COCs exceed cleanup levels.

Worker Safety

Worker safety issues were considered in the formulation of the phased diesel fuel recovery plan and will be further developed during remedial design and remedial action. Numerous federal and state Superfund cleanups occur at operating industrial facilities. Construction activities occur on a regular basis within active railyards. Similarly, remediation construction activities within an active railyard must be performed with the highest concern for worker safety and protection. Using planning, coordination, train-spotters, radio communication and daily safety meetings will ensure the installation, maintenance and operation of the diesel fuel recovery system can occur safely.

To reduce worker risk during construction and operation and maintenance activities, Phase I recovery wells will be installed in areas of the LRY with reduced or no train traffic. Envirocon, Inc. demonstrated that a multiple-well pilot-test diesel recovery system (Test Cell 4) could be successfully constructed within active train tracks without worker injury.

DEQ understands most railroads request wells installed in active railyards to be flush mounted to prevent tripping hazards. BNSF and its contractor, Envirocon, Inc., will coordinate with MRL about safety protocols MRL uses to protect MRL workers while working amongst active rail tracks. Construction personnel installing and operating the diesel recovery system will follow the same strict safety rules within the railyard that MRL workers follow. Similar coordination will occur with Talgo-LRC, LLC.

Groundwater Monitoring

Groundwater will be monitored to: 1) help ensure no additional migration of contaminants in the groundwater; 2) evaluate the effectiveness of monitored natural attenuation of VOCs and dissolved phase petroleum in the groundwater; 3) evaluate the effectiveness of source removal at the electric shop, transfer pit manways, and locomotive shop manways and other interim actions; and 4) ensure there are no receptors using groundwater above acceptable levels. The selected remedy includes the installation of eight new monitoring wells. Select wells will be monitored semi-annually during high and low groundwater elevations for 3 years for VOCs, EPH, VPH, PAHs (via method 8270), lead, and petroleum MNA parameters (redox potential, nitrate plus nitrite, ammonia, dissolved oxygen, ferrous or soluble iron, and sulfate) at which time the monitoring frequency will be re-evaluated. Water levels in monitoring wells will also be measured semi-annually during high and low groundwater elevations.

A well inventory will be completed for the area within and adjacent to the VOC and petroleum groundwater plumes. The last well inventory for the entire site was completed in 1989 as part of the RI. A more recent limited well inventory was conducted east of the Yellowstone River in 1998. Any domestic or commercial use wells within this area will be monitored for VOCs, and if located within or near the dissolved phase petroleum plume, will be monitored for EPH and PAHs at least annually. Monitoring frequency may be revised based upon results from previous monitoring (e.g. more frequent monitoring may be necessary if data indicates an increasing trend in contaminant concentrations approaching maximum contaminant levels for drinking water in a domestic or commercial use well). Any residence or business with a well confirmed to be approaching, meeting, or exceeding maximum contaminant levels will be connected with alternate water, which typically means connected to city water, at no cost to the resident or business as part of the remedial design.

Free Product Monitoring

Free product will be monitored to evaluate the effectiveness of Phases I and II as specified in the remedial design.

Cap Maintenance

The cap, vegetation, and fencing at the cinder pile will be inspected and maintained to ensure the integrity of the remedy.

F. Institutional Controls

Section 75-10-701(11), MCA of CECRA defines institutional controls (ICs) as a restriction on the use of real property that mitigates the risk posed to public health, safety, and welfare and the environment. Since ICs rely primarily on administrative means to restrict use, effective ICs are layered with other ICs or engineering controls.

ICs are a necessary component of the remedy where cleanup standards are not yet met. At the BN Livingston Shop Complex, ICs fall into two primary categories. These categories and their purposes are set forth below.

Controlled Groundwater Area

A controlled groundwater area (CGWA) will be implemented to restrict groundwater use for domestic purposes (drinking, showering, bathing, cooking, etc. at homes or businesses) at the site. The CGWA will be protective of human health by restricting domestic use of the groundwater. High yield industrial or irrigation wells that may cause expansion of the plume should also be prevented. It will be protective of the environment to prevent well usage that would cause an expansion of the plumes. The CGWA will remain in place until groundwater cleanup levels for COCs in groundwater are met. The ROD requires groundwater cleanup levels to be met within a reasonable time (20 years).

DEQ has already begun the CGWA process, which is being implemented pursuant to sections 85-2-501, et seq., MCA. The decision regarding the CGWA rests with the Montana Department of Natural Resources and Conservation (DNRC), with input from the public.

Use of groundwater within the City of Livingston is already prohibited through ordinance. For those otherwise affected by the CGWA, the ROD requires alternate water be supplied, which typically means connection to city water.

Restrictive covenants

Both the current and reasonably anticipated future use of certain parcels is commercial. These parcels include the LRY and the C&P Packing property. For these two parcels, the ROD requires restrictive covenants to be implemented restricting the properties to certain uses.

For the LRY property, cleanup levels for PAH contaminated soils are based on a worker scenario; therefore, the property must remain in industrial use for the cleanup to be protective. For the C&P Packing property, the cleanup level for any lead contaminated soils is based on an industrial scenario; the property must remain in industrial use for the cleanup to be protective. The commercial/industrial zoning of these two properties offers another level of ICs.

For the cinder pile, the remedy calls for capping of the pile. Restrictions must be placed on this part of the property to restrict access, development, excavation, or use of the pile to help ensure the integrity of the cover. For the free product and dissolved petroleum plume beneath the LRY, restrictive covenants must limit use of the groundwater (i.e., monitoring or recovery wells are allowable) to prevent its use and the possible expansion of the plume caused by extracting groundwater near the plume boundaries.

Section 75-10-727, MCA provides a procedure for implementing restrictive covenants.

G. Cleanup Levels

Table 1 lists the soil and groundwater cleanup levels for the site. For soil, the primary COCs are: PCE, TCE, cis-DCE, vinyl chloride, chlorobenzene, 1,4-dichlorobenzene, lead, PAHs, extractable petroleum hydrocarbons, and asbestos. For groundwater, the primary COCs are: PCE, TCE, cis-DCE, vinyl chloride, chlorobenzene, 1,4-dichlorobenzene, lead, PAHs, extractable petroleum hydrocarbons (dissolved phase petroleum), and free product diesel. For indoor air, the primary COCs are: PCE, TCE, cis-DCE, trans-DCE, and vinyl chloride.

Clean up levels are based both on ERCLs and protection of public health, safety, and welfare and of the environment. The primary bases for each cleanup level is set forth below.

- VOC-contaminated sludge: If any additional sludge is discovered on-site in the future, it will be removed and disposed of off-site consistent with the interim action and in compliance with all laws.

- VOCs in soils: These cleanup levels are calculated from the Montana Department of Environmental Quality, Circular WQB-7, Montana Numeric Water Quality Standards

(September, 1999). Soil cleanup levels were calculated using a fate and transport model developed by a BNSF contractor, RETEC (Mathematical Model for Calculation of Soil Cleanup Criteria Based on Leaching to Groundwater, RETEC undated).

- PAHs in surficial soils: These cleanup levels are calculated from the BRA exposure parameters but include dermal exposure as an additional pathway.[3] Please refer to Appendix D.

- Petroleum and PAHs in soil: The cleanup levels for petroleum hydrocarbons in soil are screening levels and are from DEQ's *Tier 1 Risk-Based Corrective Action Guidance Document*, Final Draft, March 2000. Should concentrations in samples collected following the approved sampling and analysis plan exceed these screening levels, a cleanup level will be calculated using the methods provided in the *Tier 1 Risk-Based Corrective Action Guidance Document*.

- Lead in soils: These levels are screening levels rather than cleanup levels. These levels are found in Environmental Protection Agency, Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil (EPA, December 1996) and the associated Frequently Asked Questions on the Adult Lead Model Guidance Document (EPA, April 1999) and the EPA Region IX PRGs (EPA, November 2000). Should concentrations in samples collected following the approved sampling and analysis plan exceed these screening levels, these levels will either be used as the cleanup levels or an approved site-specific level based on the methodology set forth in Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead may be developed.

- Asbestos-contaminated soil and debris: For asbestos found outside of the cinder pile at levels greater than one percent, remediation alternatives must be considered and the asbestos remediated. All other solid waste (including hazardous waste other than media) must be removed, treated if practicable, and properly disposed off-site.

- VOCs in groundwater: These cleanup levels are found in the Montana Department of Environmental Quality, Circular WQB-7, Montana Numeric Water Quality Standards (September, 1999) which are the State's water quality standards. These

[3] In calculating the ROD PAH clean up level from the BRA, it was noted that dermal exposure was not included as a pathway in the BRA assumptions. Dermal exposure would now be considered a standard pathway in this type of risk determination. Therefore, the ROD contains the cleanup levels derived from the BRA exposure parameters, but including dermal exposure as a pathway. The cleanup level developed represents a total carcinogenic PAH concentration. This concentration is based on the toxicity of benzo(a)pyrene. The relative toxicity of each carcinogenic PAH to benzo(a)pyrene is used to adjust its concentration. Following this adjustment the resulting concentrations are summed. The summed exposure point concentration must not exceed the total carcinogenic PAH cleanup level.

standards were developed to comply with the Montana Water Quality Act requirement that standards be adopted to protect the present and future beneficial uses of State waters (§ 75-5-301, MCA).

- Lead in groundwater: This cleanup level is found in the Montana Department of Environmental Quality, Circular WQB-7, Montana Numeric Water Quality Standards (September, 1999).

- Free product on groundwater: This cleanup level is found in State and federal Underground Storage Tanks regulations requiring free product removal to the maximum extent practicable.

- Petroleum and PAHs in groundwater: PAH cleanup levels are found in the Montana Department of Environmental Quality, Circular WQB-7, Montana Numeric Water Quality Standards (September, 1999). The cleanup levels for petroleum hydrocarbons in groundwater are screening levels and are from DEQ's *Tier 1 Risk-Based Corrective Action Guidance Document*, Final Draft, March 2000. Should concentrations in samples collected following the approved sampling and analysis plan exceed these screening levels, a cleanup level will be calculated using the methods provided in the *Tier 1 Risk-Based Corrective Action Guidance Document*.

- Basement Gas: These levels are screening levels rather than cleanup levels. These screening levels are found in Region IX PRGs (EPA, November 2000). Should concentrations in samples collected following the approved sampling and analysis plan exceed these screening levels, cleanup levels will be calculated based on the carcinogenic and noncarcinogenic exposure parameters included in the BRA, with the exception of the exposure time. The exposure time must be 24 hours/day in order to protect residents who remain in the home throughout the majority of the day (e.g., children, the elderly, and those who work at home).

H. Estimated Remedy Costs

DEQ estimated the total present worth cost of the remedy to be $2,229,028 (using a 7% present worth discount factor). This is $277,400 less than the Proposed Plan costs for the preferred remedy. This was based on generally conservative assumptions. Capital costs were calculated for direct implementation of the remedy (e.g. excavation, clean fill, design costs, well construction materials, MRL spotter). Operation and maintenance costs were calculated based on the appropriate number of years of operation for the specific remedy component. Operation and maintenance costs included activities such as inspections of the free product recovery system, free product disposal, labor for maintaining the free product recovery system, and mowing the cinder pile. The ICs cost includes provision of alternate water.

DEQ relied upon costs presented in the FS and Proposed Plan when appropriate. However, based upon the cinder pile capping requirements, the assumption that some private wells will require long-term monitoring, and other site-specific information set forth in the ROD, DEQ revised the cost assumptions for the selected remedy. DEQ did calculate costs for Phase II of the free product recovery component of the remedy. The costs assume an additional 20 wells will be added as part of Phase II. These revised costs for the selected remedy are presented in Table 38.

Cost Uncertainties

DEQ could not calculate costs for some components of the selected remedy due to the limited information regarding the nature and extent of some of the contaminated areas (potential lead and petroleum contamination in soil and groundwater; PAHs in surficial soil). Remedial design will play a critical role in determining final costs and will be more reflective of actual costs. Subsequent investigation during remedial design will provide the information needed to determine costs for certain components of the remedy. These costs will be presented in an alternatives evaluation performed as part of remedial design. In approving subsequent alternatives in the remedial design, DEQ will ensure those remedial alternatives are cost-effective.

Other uncertainties that may affect the costs of the selected remedy include:

- Costs for the contingency of localized pump and treat for VOC contaminated groundwater were not included in the overall cost of the selected remedy.

- The time required for monitoring may increase or decrease the costs of monitoring.

- Engineer/Contractor contingencies (typically 20%) were not included on capital costs, but were also not included in the FS costs.

- Costs for excavation and off-site disposal of sludge were not included in the overall cost of the selected remedy, since the volume of sludge that may require disposal is unknown. There is a potential that sludge may be present at C&P Packing.

- Costs for cleanup of petroleum contaminated surface soils is not included, since the volume of soil that may require cleanup and the cleanup alternative is unknown. There is a potential that petroleum contaminated surface soil poses an unacceptable risk at LRY and C&P Packing.

- Costs for cleanup of lead contaminated soils and groundwater is not included in the overall cost of the selected remedy, since the volume of soil and groundwater that may require cleanup is unknown. There is a potential that lead

contaminated soils may be present at C&P Packing, and lead contaminated groundwater may be present at LRY and C&P Packing.

- Costs for cleanup of PAH contaminated surface soils is not included in the overall cost of the selected remedy, since the volume of soil that may require cleanup and the cleanup alternative is unknown.

- The number of private wells that may require long-term monitoring is an estimate and may increase or decrease the costs of monitoring. The updated well inventory will identify the number of wells that will require monitoring.

- The number of homes with unacceptable risk from contaminated indoor air is an estimate and may increase or decrease the cost of the selected remedy.

- The cost for provision of alternate water is an estimate and may increase or decrease the overall cost of the remedy.

- The cost for confirmation sampling is not included in the overall cost of the selected remedy, since the number of samplings that may be required is unknown.

XI. STATUTORY DETERMINATIONS

A. Introduction

CECRA, as amended, 1991

Under Section 75-10-721, MCA, of CECRA, DEQ must select remedies that will attain a degree of cleanup of the hazardous or deleterious substance and control of a threatened release or further release of that substance that assures protection of public health, safety, and welfare and of the environment. Section 75-10-721, MCA also requires that the remedy meet applicable state or federal environmental requirements, criteria, or limitations and substantive state or federal environmental requirements, criteria, or limitations that are well-suited to site conditions.

In addition, DEQ must select a remedy that, at a minimum, protects public health, safety and welfare and the environment, and that uses permanent solutions, uses alternative treatment technologies or resource recovery technologies to the maximum extent practicable, and is cost-effective, taking into account the total short- and long-term costs of the actions, including operations and maintenance activities for the entire period during which the activities will be required.

CECRA, as amended, 1995 and 1999

Although not required by statute to do so (due to a 1995 legislative savings clause), the selected remedy also complies with CECRA remedy requirements as enacted by the legislature through 2001.[4] The selected remedy will attain a degree of cleanup of the hazardous or deleterious substance and control of a threatened release or further release of that substance that assures protection of public health, safety, and welfare and of the environment. The selected remedy will meet applicable state or federal environmental requirements, criteria, or limitations and substantive state or federal environmental requirements, criteria, or limitations that are relevant to site conditions.

The selected remedy, considering present and reasonably anticipated future uses, and giving due considerations to institutional controls, demonstrates acceptable mitigation of exposure to risks to the public health, safety, and welfare and the environment is effective and reliable in the short -term and the long-term, is technically practicable and implementable, uses treatment technologies or resource recovery technologies if practicable, giving due consideration to engineering controls, and is cost-effective.[5] In addition, the selected remedy is acceptable to the majority of the affected community, as indicated by community members and the local government.

CERCLA

The selected remedy complies with CERCLA to the extent practicable and is also not inconsistent with the NCP (which contains the implementation regulations of CERCLA). CERCLA Section 121 requires that remedies be protective of human health and the environment, comply with applicable and relevant and appropriate requirements, are cost-effective, and utilize permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and

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4 CECRA § 75-10-721 was amended during the 1995 legislative session. *See* Chapter 584, Laws of Montana, 1995. One of the revisions pertained to the development and selection of ERCLs. However, Section 15 of Chapter 584 states that the 1995 revisions and amendments do not apply to civil actions commenced or begun prior to the effective date of the 1995 act. The complaint in State of Montana v. Burlington Northern, Inc., Burlington Northern Railroad Company and Glacier Park Company CV 88-141-H-CCL was filed December 27, 1988 and pertains to the Burlington Northern Livingston Railyard Site, and other Burlington Northern Facilities. The suit is still on going. Therefore, these ERCLs comply with CECRA as amended in 1991, rather than CECRA as amended by Chapter 584, Laws of Montana, 1995.

5 Under 75-10-721, MCA (1999), cost-effectiveness is determined through an analysis of incremental costs and incremental risk reduction and other benefits of alternatives considered, taking into account the total anticipated short-term and long-term costs of remedial action alternatives considered, including the total anticipated cost of operation and maintenance activities.

significantly reduces the volume, toxicity, or mobility of hazardous wastes as their principal element.

The following sections discuss how the selected remedy meets each of these statutory requirements.

B. Protection of Public Health, Safety, Welfare and the Environment

Both CERCLA and CECRA require present and future protection of human health and the environment as a threshold criterion. In addition, CECRA also requires present and future protection of public safety and welfare.

The selected remedy protects public health, safety, welfare, and the environment through the following:

Abandonment and replacement of VOC-contaminated municipal wells implemented under an interim action eliminated a current and potential groundwater ingestion pathway.

Temporary placement of a groundwater control area to prohibit use of groundwater for domestic use in the VOC-contaminated plume eliminates a current and potential groundwater ingestion pathway.

Source removal of VOC-contaminated soil and sludge, and in-situ SVE treatment of VOC-contaminated soil, implemented under interim actions, decreased the potential for unacceptable human health and safety risks to workers.

Source removal of the remaining VOC-contaminated soil will decrease the potential for unacceptable human health risks to workers.

Source removal of VOC-contaminated soil and sludge, in-situ SVE treatment of VOC-contaminated soil, replacement of leaking wastewater lines and manways, and retrofitting of WWTP grit chambers, all implemented actions, have aided in the elimination of the source of VOC contamination to groundwater.

Source removal of remaining VOC-contaminated soil will eliminate the source of VOC contamination to groundwater.

Source removal of VOC-contaminated soil and sludge, in-situ SVE treatment of VOC-contaminated soil, replacement of leaking wastewater lines and manways, and retrofitting of WWTP grit chambers, all implemented actions, have aided in prevention of the current and potential groundwater ingestion pathway that would pose an unacceptable human health risk.

Source removal of remaining VOC-contaminated soil followed by monitored natural attenuation will prevent the current and potential groundwater ingestion pathway that would pose an unacceptable human health risk.

Source removal of VOC-contaminated soil and sludge, in-situ SVE treatment of VOC-contaminated soil, replacement of leaking wastewater lines and manways, and retrofitting of WWTP grit chambers, all implemented under interim actions, are aiding in restoration of groundwater to its beneficial use within a reasonable time.

Source removal and treatment of the remaining VOC-contaminated soil followed by monitored natural attenuation will restore groundwater to its beneficial use within a reasonable time.

Removal of underground storage tanks and associated piping, source removal of certain petroleum-contaminated soils, installation of track pans, and related actions, implemented actions, will aid in restoration of groundwater to its beneficial use within a reasonable time.

Limited source removal of free product from groundwater implemented under an interim action has aided in restoration of groundwater to its beneficial use.

Source removal of free product from groundwater followed by MNA will restore groundwater to its beneficial use within a reasonable time.

Removal of petroleum-contaminated gravel from the Yellowstone River and plugging of the discharge line implemented under an interim action prevented the release of contaminated materials into surface waters.

Removal of visible asbestos from the surface of the cinder pile implemented under an interim action aided in the prevention of the current and potential air pathway that would pose an unacceptable human health risk.

Covering, revegetating the cinder pile, fencing and applying deed restrictions, eliminates the current and potential air pathways that would pose an unacceptable human health risk.

Venting of households with unacceptable levels of VOCs in indoor air, implemented under an interim action, eliminated a current and potential air pathway that would pose an unacceptable human health risk.

Venting of any additional households with unacceptable levels of VOCs in indoor air, will eliminate a potential air pathway that would pose an unacceptable human health risk.

Remediation of the PAH-contaminated soil will prevent the current and potential human ingestion surface soil pathway for workers that would pose an unacceptable safety and human health risk.

Remediation of TPH-contaminated soil will prevent the current and potential human ingestion surface soil pathway for workers that would pose an unacceptable safety and human health risk.

Remediation of any lead-contaminated soil will prevent the current and potential human ingestion surface soil pathway for workers that would pose an unacceptable safety and human health risk.

Temporary placement of ICs to prohibit use of groundwater for domestic use in the diesel plumes eliminates a potential groundwater ingestion pathway.

C. Compliance with Environmental Requirements, Criteria and Limitations

The final determination of Environmental Requirements, Criteria and Limitations ("ERCLs") are listed in Appendix A of this ROD. The selected remedy will comply with all applicable and well-suited ERCLs. The remedy will also comply with all applicable and *relevant* ERCLs under CECRA, as revised (but inapplicable to this site).[6] In addition, the remedy will also comply with all applicable relevant and appropriate requirements under CERCLA. No waiver of ERCLs or ARARs is necessary. Some significant ERCLs and ARARs compliance issues are discussed below, although the discussion is not all-inclusive. The full ERCLs are set forth in Appendix A.

Groundwater

For VOCs and SVOCs, the contaminant-specific ERCLs to comply with which will guide the remedial action are the standards specified in Circular WQB-7.

Certain actions (source removal of VOC-contaminated soil and sludge, in-situ SVE treatment of VOC-contaminated soil, replacement of leaking wastewater lines and manways, and retrofitting of WWTP grit chambers), coupled with the remedial actions set forth in the selected remedy (source removal and treatment of the remaining VOC-

[6] In CECRA (1999), "relevant" has replaced "well-suited." CECRA (1999) also gives DEQ the discretion not to require compliance with relevant requirements. DEQ does not have such discretion under CECRA (1993) and has determined that all relevant requirements will have to be met. "Relevant" is not defined in CECRA (1999), but seems to be substantially similar to the first prong of CERCLA's "relevant and appropriate." CERCLA's NCP defines "relevant" as "addressing similar situations or problems." 55 Fed.Reg. 8743 (March 8, 1990). DEQ has determined that it is identified well-suited requirements set forth in Appendix A of the ROD both address similar situations or problems and are well suited to the particular site. Therefore, the ERCLs comply with both CECRA (1999) and CERCLA as well as CECRA (1993).

contaminated soil followed by monitored natural attenuation) will lead to compliance with WQB-7 human health groundwater standards within a reasonable time.

For the diesel plume, the ERCLs to comply with and which will guide the remedial action are the water quality standards, such as specified in section 75-5-605, MCA (which prohibits the causing of pollution) and section 75-5-303, MCA (nondegradation) and the federal and state underground storage tank regulations. The federal regulations specifically require removal of free product to the maximum extent practicable as determined by the implementing agency, which leads to effective corrective action.

Certain actions (removal of underground storage tanks and associated piping, source removal of certain petroleum-contaminated soils, installation of track pans, limited source removal of free product) have helped in compliance with water quality standards. The remedial actions set forth in the selected remedy (source removal of free product from groundwater and soil to cleanup levels followed by monitored natural attenuation) will comply with the federal and state underground storage tank regulations and will lead to compliance of water quality requirements within a reasonable time.

Surface Water

There are no known exceedances of surface water quality standards. Although remediation of surface water is not a component of the selected remedy, certain actions, such as washing of equipment that has come into contact with hazardous waste, will involve water handling. The selected remedy requires that all water quality standards be met and that any discharge occurs under an appropriate MPDES permit.

Asbestos

For the cinder pile, the ERCLs to comply with and which will guide the remedial action are the standards specified in the State solid waste regulations.

The interim action (removal of visible asbestos from the surface of the cinder pile) followed by remedial actions set forth in the selected remedy (covering and revegetating the cinder pile, fencing and applying restrictive covenants) will comply with the State solid waste regulations.

RCRA Requirements

The selected remedy calls for excavation of VOC-contaminated soils and off-site disposal of all solid and hazardous wastes except for the cinder pile and ex-situ soils treated to below cleanup levels.

Certain of the wastes at the site demonstrate the characteristic of toxicity, and are therefore characteristic hazardous wastes upon excavation. The site also contains F001 and F002, which are listed hazardous wastes for chlorinated solvents. The various

media and wastes at the site contaminated by the F001 and F002 wastes are also hazardous wastes pursuant to 40 CFR 261 upon excavation. The RCRA requirements are applicable requirements for the treatment, storage and disposal of these wastes.

Properly implemented, the selected remedy complies with RCRA Subtitle C requirements.

Worker Safety

The safety regulations are not ERCLs but are independently applicable. They are included in this section however, because of their import (since the remedial action will occur at an operating rail facility). The selected remedy will comply with all federal and state safety laws. In addition, the selected remedy requires compliance with the operator's health and safety manual. In this way, the selected remedy assures both worker safety and environmental compliance.

D. Cost-effectiveness

The selected remedy is cost-effective, taking into account the total short- and long-term costs of the actions, including operations and maintenance activities for the entire period during which the activities will be required. The selected remedy provides overall effectiveness proportionate to its costs. To the extent that the estimated cost of the selected remedy exceeds the costs of the other alternatives, the difference in cost is reasonably related to the greater overall effectiveness of the selected remedy. The detailed evaluation of the balance of these criteria among the alternatives considered is set forth in the final feasibility study reports and in Section IX, Summary of Comparative Analysis of Alternatives, of this ROD.[7]

The estimated cost of the selected remedy is $2,229,028. To a large extent, the remedy relies on monitored natural attenuation after initial source removal rather than pump and treat technologies. In addition, asbestos waste is capped rather than removed and the diesel recovery is being implemented in a phased approach, building

[7] Under section 75-10-721, MCA (1999), cost-effectiveness is determined through an analysis of incremental costs and incremental risk reduction and other benefits of alternatives considered, taking into account the total anticipated short-term and long-term costs of remedial action alternatives considered, including the total anticipated cost of operation and maintenance activities. Although not applicable to this selected remedy due to the 1995 savings clause, the selected remedy is cost-effective under this criterion as well. Of those alternatives that are protective of public health, safety and welfare and the environment, and comply with ERCLs, DEQ has determined that the selected remedy provides the best balance of incremental costs and incremental risk reduction taking into account the total anticipated short-term and long-term costs of remedial action alternatives considered, including the total anticipated cost of operation and maintenance activities. The detailed evaluation of the balance of these criteria among the alternatives considered is set forth in Section IX, Summary of Comparative Analysis of Alternatives, and discussed in Section X, Selected Remedy, of this ROD.

on knowledge gained in the previous phase. Each of these offers a cost-effective alternative as the selected remedy while still assuring a remedy that will attain a degree of cleanup that is protective of public health, safety, and welfare and the environment as well as compliance with applicable state or federal ERCLs and substantive state or federal ERCLs that are well suited to site conditions. Source removal, although causing greater short-term costs, significantly reduces long-term costs and also allows the remedy to avoid pump and treat technologies. Short-term costs due to worker safety concerns provide added protection in proportion to its costs. Some of the costs referenced by the commenter, such as spotter costs, were included in the cost estimates. The additional cost of long-term monitoring is reasonably related to the greater overall effectiveness of the selected remedy.

E. Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable

The selected remedy represents the maximum extent practicable to which permanent solutions, alternative treatment technologies or resource recovery technologies can be utilized. Of those alternatives that attain a degree of cleanup protective of public health, safety, and welfare and the environment, and comply with ERCLs, DEQ has determined that the selected remedy provides the best balance of trade-off in terms of long-term effectiveness and permanence, reduction in toxicity, mobility or volume through treatment short-term effectiveness, implement ability and cost while also considering community acceptance and CERCLA's statutory preference for treatment as a principal element in the remedy. The detailed evaluation of the balance of these criteria among the alternatives considered is set forth in the final feasibility study reports and is summarized in Section IX, Summary of Comparative Analysis of Alternatives, of this ROD. Community acceptance is discussed in Section III of the ROD and the Response Summary.

The selected remedy includes removal and treatment of contaminated media and removal of diesel in the groundwater. These actions will permanently and significantly reduce the principal threats posed by the soil and groundwater. By using treatment of contaminated media, the selected remedy provides the most effective and permanent treatment of any of the alternatives considered and complies with CERCLA's preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as their principal element. Through reprocessing of removed diesel, the selected remedy provides resource recovery to the maximum extent practicable. The other alternatives considered for VOC-contaminated soil and groundwater which were protective of public health, safety and welfare and the environment, and complied with ERCLs did not provide a similar reduction in toxicity, mobility and volume as did the selected remedy. For diesel-contaminated media, the other alternatives considered which were protective of public health, safety and welfare and the environment, and complied with ERCLs, the selected remedy offers cleanup of soils and the most effective removal of free product.

With regard to the short-term effectiveness of the remedy, including consideration of the risks involved to workers and the community as the remedy is being implemented, DEQ has spent significant effort in crafting a protective remedy that also assures protection of public health, safety, and welfare and compliance with ERCLs. The safety measures are set forth in Section X, Selected Remedy, of the ROD.

The remedy utilizes alternative treatment technologies. In the diesel alternative, the remedy employs soil venting once free product is removed to the maximum extent practicable. Soil venting is an alternative treatment technology designed to utilize existing soil microbes to degrade petroleum hydrocarbons in the subsurface.

XII. DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for the site was released for public comment on September 22, 1998. The plan identified alternative 6 for soil and groundwater and modified F for diesel fuel as DEQ's preferred remedy for the BN Livingston Complex. DEQ has reviewed all written and oral comments for the Proposed Plan submitted during the public comment period. The following specific changes have been made from the proposed plan.

A. Indoor Air / Basement Gas

In response to several commenters' requests to reevaluate the protectiveness of indoor air sampling, DEQ has determined further sampling beyond that noted in the Proposed Plan is necessary.

It has been approximately eight years since the last sampling event occurred for indoor air. In that time, much scientific research has focused on this area. Sampling methods and analysis have improved, and the risk evaluation for indoor air has evolved since that time.

The ROD sets forth EPA Region IX PRGs as screening levels for ambient air. These PRGs address both carcinogenic and noncarcinogenic risk, and are therefore protective of human health for indoor air.

The Proposed Plan had discussed confirmation sampling of those residences that contained the highest levels of contaminants in past sampling events followed by further action if levels are not acceptable. In addition to the proposed plan, the ROD requires further basement gas sampling at representative basements within the VOC plume to determine if residences or businesses have levels above EPA Region IX PRGs for ambient air. All residences and businesses determined to have basement gas levels above EPA Region IX PRGs for ambient air will have a removal system installed at no cost to the owner. In order to remain protective, these systems must be maintained until cleanup levels are continually met without operation of the system.

By requiring remedial action to mitigate unacceptable risks under both residential and commercial/industrial scenarios, the ROD is protective of human health.

B. PAH Contaminated Soils Within the Railyard

Upon further review of the BRA, an unacceptable potential current and future carcinogenic risk was noted to exist to railyard workers from PAH contaminated soils. Although this risk was identified in the BRA, neither the FS nor the Proposed Plan addressed this risk.

In calculating the ROD cleanup level from the BRA, it was noted that dermal exposure was not included as a pathway in the BRA assumptions. Dermal exposure would now be considered a standard pathway in this type of risk determination. Therefore, the ROD contains the cleanup levels derived from the BRA exposure parameters, but including dermal exposure as a pathway. The ROD requires approved sampling be performed, and remedial alternatives be evaluated for addressing this risk as part of remedial design. Evaluation of remedial alternatives will involve public input.

One alternative to be considered in the evaluation of alternatives is hot spot removal within railyard property. The evaluation of remedial alternatives will be followed by implementation of approved remedial action that will achieve the ROD cleanup levels.

By requiring remedial action to mitigate unacceptable risks under a commercial/ industrial scenario, the ROD is protective of human health.

C. Lead-Contaminated Soil

A new source of contamination at the site was noted on C&P Packing's property late last year, which includes a previously unidentified contaminant: lead. The ROD requires approved sampling to confirm this contamination. Since lead was not previously identified as a contaminant of concern, neither the BRA, the FS nor the Proposed Plan addressed this contamination. DEQ has determined that the commercial/industrial levels established in the Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to assessing Risks Associated with Adult Exposures to Lead in soil, including the Guidance Document for contaminated soils are the screening and potential cleanup levels for lead in soils. The cleanup level for contaminated groundwater will be WQB-7, as set forth in the ERCLs.

If either lead contamination of soil or groundwater is confirmed, the ROD requires remedial alternatives be evaluated for addressing the contamination as part of the remedial design, followed by implementation of approved remedial action to meet cleanup levels.

By requiring approved remedial action to meet cleanup levels, the ROD protects human health and the environment. (The ROD supports residential cleanup levels found in EPA Region IX PRGs for contaminated soils should a cleanup in a residential area later be discovered.)

D. Better Definition of the Plumes

The Proposed Plan called for a well use survey on the east side of the Yellowstone River and a small area northwest of the city shops. However, the present well inventory is over ten years old and it is unclear that any remaining private wells within the plume are used solely for irrigation. In response to public comment, the ROD therefore expands the survey requirement to include all wells within the plume boundaries. A revised well use survey for water use within the plume must be performed, with information on plume boundaries assisting with the identification. Consistent with the proposed plan, the ROD requires that users of contaminated groundwater within the plume be provided an alternate water supply, usually city hook up, at no cost to the well user.

As part of remedial design, the ROD requires development of a VOC plume map, which defines the outer reaches of the VOC-contaminated plume and the levels within.

For effective remedial action, The ROD also requires better definition of the free product plume (including depths) and more current information on the dissolved phase plume.

By requiring better definition of the plumes and well uses as part of remedial design, the ROD protects human health and the environment by better defining where remedial action must occur.

E. Removal of the Cinder Pile

The Proposed Plan called for removal of the cinder pile should future development occur. The volume of material in the cinder pile is estimated at 202,000 cubic yards. DEQ has determined it would not be cost-effective to remove the pile and may actually increase airborne asbestos and public health risk if the cinder pile is moved off-site.

XIII. REFERENCES

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TABLE 1. Cleanup Levels

Contaminant	Groundwater (µg/L)[a]	Soil (mg/kg)[b]		Air[f] (µg/m^3)
VOCs:				
Tetrachloroethene	5.0	4		3.3
Trichloroethene	5.0	2		1.1
Cis-1,2-Dichloroethene	70	14		37
Vinyl chloride	0.15	0.02		0.22
Chlorobenzene	100	124		--
1,4-Dichlorobenzene	75	264		--
Trans-1,2-Dichloroethene	--	--		73
Lead	15	750[c]		--
PAHs (SVOCs):	(dissolved phase)	(subsurface)[e]	(surface)	--
Total Carcinogenic	--	--	4[d]	
Acenaphthene	420	160		
Anthracene	2100	3700		
Benz(a)anthracene	0.48	13		
Benzo(a)pyrene	0.048	3		
Benzo(b)fluoranthene	0.48	45		
Benzo(k)fluoranthene	4.79	450		
Chrysene	48	1400		
Dibenzo(a,h)anthracene	0.048	6		
Fluoranthene	280	1000		
Fluorene	280	160		
Indeno(1,2,3-cd)pyrene	0.48	130		
Naphthalene	28	3		
Pyrene	210	1100		
Petroleum[e]	(dissolved phase)	(subsurface)	(surface)	--
C9-C18 Aliphatics	1000	5000	2500	
C19-C36 Aliphatics	1000	5000	5000	
C11-C22 Aromatics	1000	400	750	
Total ceiling for petroleum hydrocarbons	1000	5000	5000	
Free product on top of groundwater (diesel fuel)	Less than 1/8 inch[g]	--		--
Asbestos/solid waste limited to cinder pile[h]	18-inch infiltration layer 6-inch erosion layer, fully vegetated			

a) µg/L is equivalent to parts per billion. Groundwater levels are from Circular WQB-7, Montana Numeric Water Quality Standards, September 1999.

b) mg/kg is equivalent to parts per million. VOC soil levels were calculated using a fate and transport model developed by RETEC. Mathematical Model for Calculation Soil Cleanup Criteria Based on Leaching to Groundwater, RETEC undated.

c) EPA Technical Review Workgroup for Lead, Dec. 1996, *Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to assessing Risks Associated with Adult Exposures to Lead in Soil* including the TRWL Guidance Document, April, 1999. This is a screening level, refer to Section X for more detail.

d) The cleanup level was calculated using DEQ's March 2000 *Risk-Based Corrective Action (RBCA) Tier I* spreadsheets and site-specific assumptions. The cleanup level developed represents a total carcinogenic PAH concentration. This concentration is based on the toxicity of benzo(a)pyrene. The relative toxicity of each carcinogenic PAH to benzo(a)pyrene is used to adjust its concentration. Following this adjustment the resulting concentrations are summed. The summed exposure point concentration must not exceed the total carcinogenic PAH cleanup level.

e) Values obtained from DEQ's *Tier 1 Risk-Based Corrective Action Guidance Document*, Final Draft, March 2000. These are screening levels, refer to Section X for more detail.

f) Ambient air screening levels obtained from EPA Region IX Preliminary Remediation Goals, November 2000. These are screening levels, refer to Section X for more detail.

g) Value obtained from 40 CFR 280.64 (2000) and 40 CFR 280.43 (2000), and ARM 17.56.407 (2001).

h) Value obtained from ARM 17.50.530 (2001).

TABLE 2[1]

Sludge Volumes Removed and Disposed of by Location

Sludge Section
Livingston Rail Yard Remedial Investigation

Location	Volume (cubic yards)
API separator pond	1192
Cinder pile lagoon	709
Overflow pond	3874
WWTP sump	932
In-line grit chamber	40
WWTP surge tank	10
WWTP grit chamber	32
WWTP grit chamber filter cake	80
Cinder pile sludge	5500
TOTAL	12,369

1 Most tables are from the BRA, RI and FSs and reformatted for the ROD. Envirocon, Inc. prepared tables in the RI and FSs. Camp Dresser & McKee prepared tables for the BRA.

TABLE 3

Frequency of Occurrence of Detected VOCs in Primary Solid Sludge Samples

Sludge Section
Livingston Rail Yard Remedial Investigation

CHEMICAL	NO. OF DETECTIONS	NO. OF ANALYSES	PERCENT	MIN. DETECT. LIMIT (mg/kg)	MAX. DETECT. LIMIT (mg/kg)	MINIMUM CONCENTRATION (mg/kg)	MAXIMUM CONCENTRATION (mg/kg)
2-Chlorotoluene	12	13	92.3	N/A	1	5.5	2200
Chlorobenzene	12	14	85.7	N/A	1	1	470
Ethylbenzene	11	12	91.7	N/A	1	1.2	23
cis- 1, 2-Dichloroethene	10	14	71.4	N/A	1	1	450
m + p-Xylene	9	9	100	N/A	N/A	3.3	53
o- Xylene	9	9	100	N/A	N/A	1.6	24
1, 2-Dichlorobenzene	8	14	57.1	0.5	2	1.2	55
1, 4-Dichlorobenzene	8	14	57.1	1	5	1.1	94
Tetrachloroethene	5	14	35.7	1	2	0.7	25
Toluene	5	12	41.7	1	5	1.6	4.5
1, 3-Dichlorobenzene	3	14	21.4	0.5	5	1.2	16
Xylenes	3	3	100	N/A	N/A	4.7	110
trans-1, 2-Dichloroethene	2	14	14.3	0.5	5	1.4	1.6
Trichloroethene	2	14	14.3	0.5	2	5.7	10
4-Chlorotoluene	1	2	50	N/A	2	N/A	3.6
1, 1-Dichloroethene	1	14	7.1	1	5	N/A	0.8

N/A - Not applicable

TABLE 4

Descriptive Statistical Information for Subsurface Soil

Soil Section

Livingston Rail Yard Remedial Investigation

CHEMICAL PARAMETER	NO. OF DETECTIONS	NO. OF ANALYSES	PERCENT DETECTED	MINIMUM CONCENTRATION (µg/kg)	MAXIMUM CONCENTRATION (µg/kg)	ARITHMETIC MEAN (µg/kg)	STANDARD DEVIATION
VOCs							
Tetrachloroethene	45	148	30.4	5.4	420000	33100	346100
2-Chlorotoluene	31	148	20.9	9.4	69000	2070	8472
Chlorobenzene	21	148	14.2	6.4	34000	710	3530
1, 4-Dichlorobenzene	20	148	13.5	6.6	162000	1570	13530
1, 2-Dichlorobenzene	18	148	12.2	17	900000	6300	74000
Trichloroethene	16	148	10.8	5	1800000	12000	148000
1, 3-Dichlorobenzene	14	148	9.5	5.5	94000	710	7720
cis-1, 2-Dichloroethene	13	148	8.8	5.7	710000	4900	58400
Xylenes	8	59	13.6	40	2400	124	380
Methylene Chloride	8	148	5.4	5.4	68	47	108
o-Xylene	7	10	70	200	1400	580	506
Ethylbenzene	6	69	8.7	45	450	53.4	113
m +p Xylene	4	10	40	230	3100	450	945
1, 2, 4-Trimethylbenzene	3	4	75	620	2000	930	843
n-Propylbenzene	3	4	75	230	1500	660	677
Naphthalene	3	4	75	360	1500	790	723
sec-Butylbenzene	3	4	75	320	1500	690	663
n-Butylbenzene	3	4	75	610	1900	860	793
Toluene	2	69	2.9	142	160	40.6	90
Isopropylbenzene	2	4	50	260	490	210	213
trans-1, 2-Dichloroethene	2	148	1.4	400	5500	83	461
Bromodichloromethane	1	148	0.7	N/A	25	47	108
Benzene	1	69	1.4	N/A	160	39	89
p-Isopropyltoluene	1	4	25	N/A	230	110	93
1, 3, 5-Trimethylbenzene	1	4	25	N/A	240	110	98
4-Chlorotoluene	1	14	7.1	N/A	9.5	74	131
1, 1-Dichloroethene	1	148	0.7	N/A	30000	250	2460
Vinyl Chloride	1	148	0.7	N/A	11000	120	906
SVOCs							
Phenanthrene	27	51	53	90	80000	5300	13120
Naphthalene	12	52	23	330	11000	1400	2140
Fluorene	11	52	21	1700	17000	1700	3120
Fluoranthene	11	52	21	90	12000	1200	2240
Pyrene	9	52	17.3	130	9600	1000	1710
Benzo(b)Fluoranthene	6	52	12	90	9600	880	1550
Acenaphthene	5	52	10	1700	9800	1100	1880
1, 4-Dichlorobenzene	5	51	10	1600	220000	5300	30800
1, 2-Dichlorobenzene	4	51	8	1000	1100000	22000	154000
Chrysene	4	52	8	80	5500	820	1210
Benzo(a)anthracene	4	52	8	40	4300	770	1050
Benzo(a)pyrene	3	52	6	1700	3300	750	964
1, 3-Dichlorobenzene	2	51	4	1600	120000	3000	16700
Dibenzo(a,h) anthracene	2	52	4	460	1600	660	837
Benzo(ghi)perylene	2	52	4	1200	3200	710	901
Indeno(1, 2, 3-cd)pyrene	2	52	4	1000	3200	710	899
Phenol	2	49	4.1	830	1300	390	510
1, 2, 4-Trichlorobenzene	1	51	2	N/A	13000	880	1920
Benzo(k)fluoranthene	1	52	2	N/A	1100	660	829
METALS (TOTAL)				(mg/kg)	(mg/kg)	(mg/kg)	
Arsenic	20	50	40	0.03	48	5.6	7.7
Barium	50	50	100	14	450	167	111
Cadmium	8	50	16	0.2	10.2	1	1.7
Chromium	49	50	98	3.3	120	26	28
Lead	43	50	86	5	790	85	171
Mercury	2	49	4.1	0.06	0.51	0.5	0.06
Selenium	6	50	12	0.01	43	3.9	6.5
Silver	1	50	2	N/A	4.5	2.5	0.5
PESTICIDES/PCBs				(mg/kg)	(mg/kg)	(mg/kg)	
PCB-1248	1	35	2.9	N/A	154	231	345
beta-BHC	2	35	5.7	16	30	5.9	8.38

TABLE 5

TPH Concentrations in Alluvium
From Well Drill Cuttings

Hydrocarbon Section
Livingston Rail Yard Remedial Investigation

WELL	DEPTH (ft)	TPH (ppm)	DEPTH TO WATER (ft)
Wells Outside the Freight-Train Plume			
90-4	5	50	5
90-4	10	75	5
90-5	10	95	7
90-3	15	<10	4.5
89-3	20	<10	18.5
90-2B	20	50	19.5
89-9	20	375	20.5
89-9	20 (Dup)	385	20.5
89-9	25	90	20.5
89-3	25	100	18.5
89-9	30	33	20.5
89-9	32 - 33 (Bedrock)	70	20.5
Wells Within the Freight-Train Plume			
HR-1D	15	30	20
HRO-7	16	40	20
HRO-5	17	65	20
90-1A	20	2000	22
HRO-7	20	2750	20
HRO-5	21	1050	20
HRO-15	22	1280	21
HRO-16	22 - 28	1680	20.5
HRO-13	22 - 29	780	22
HRO-11	22 - 30	1200	21
HRO-18	22 - 30	3400	21
HRO-8	23	6500	24.5
HR-1W	23 - 24	1060	20
HRO-10	24.5	2750	24.5
HRO-19	25	380	21.5
HRO-6	25	4500	20
HRO-12	27 - 32	40	22
HRO-14	27 - 40	85	21
HR-2D	28	3500	24.5
HR-1D	28	55	20
HRO-7	28	150	20
HRO-5	29	170	20
HRO-13	29 - 33	105	22
HR-1D	30	30	20
HRO-16	30 - 39	130	20.5
HRO-15	32 - 44	45	21
HR-2W	34	60	24.5
HR-2W	34 (Dup)	65	24.5
90-1B	34	40	22
90-1B	36	38	22
90-1A	39 - 40	35	22

TABLE 6

Volumes of Contaminated Soil Estimated During the time the RI was Released

Soil Section
Livingston Rail Yard Remedial Investigation

AREA	PREDOMINATE CONTAMINANT	ESTIMATED VOLUME (cu. yd.)	APPROXIMATE DIMENSIONS length x width x depth (ft.)
Post-1943 Drain Line (filled channel)	Heavy Hydrocarbons	850	900 x 10 x 2.5
Drain Line Man ways (11 man ways)	Chlorinated VOCs	50 - 75 per man way	Radius 7 feet x 10 foot depth
In-Line Grit Chamber	Heavy Hydrocarbons & Chlorinated VOCs	850	45 x 25 x 20
Electric Shop	Chlorinated VOCs	560	40 x 25 x 15
WWTP Grit Chambers	Chlorinated VOCs	600	40 x 45 x 9 (Grit Chamber) Contaminants extend 6' from walls Average Depth 15'
WWTP Sump	Heavy Hydrocarbons & Chlorinated VOCs	1700	175 x 20 x 45
Waste-Oil Recycling Plant	Heavy Hydrocarbons & Chlorinated VOCs	200	25 x 20 x 10
API Separator/ Overflow Pond	Heavy Hydrocarbons & Chlorinated VOCs	5200	500 x 80 x 3.5
Cinder Pile	Heavy Hydrocarbons & Chlorinated VOCs	4700 (lagoon) 2400 (relic lagoon) 5100 (buried sludge)	145 x 35 x 25 160 x 20 x 20 110 x 50 x 25
Depot	Diesel Fuel	500 (passenger) 7000 (freight)	75 x 15 x 12 200 x 20 x 15
Freight Train	Diesel Fuel	18000 (fueling area) 1800 (containment cell around 25,000 gal. tank) 700 (grit chamber)	400 x 80 x 15 65 x 50 x 15 60 x 30 x 10
Track Pan	Heavy Hydrocarbons & Chlorinated VOCs	450 (west end of tracks 5 & 6) 350 (east of shop doors)	40 x 20 x 15 15 x 10 x 10 (per door)

Note:SVE = Soil Vapor Extraction

A SVE system was later installed in the waste-oil recycling plant area.

Table 7

CHEMICALS DETECTED IN SURFACE SOIL AT THE BURLINGTON NORTHERN RAIL YARD

	Frequency of Detection (Percent)	Concentration Range (µg/kg)	Background Concentration Range (µg/kg)
Organics			
1,2 Dichlorobenzene	2/30 (6.7)	300.0 - 410.0	ND
2-Methylnaphthalene	3/30 (10)	140.0 - 9,800	ND
4,4'DDD	2/41 (5)	19.0 - 97.0	ND
4,4'DDE	3/41 (7)	NA - 130	NA - 11.0
4,4'DDT	10/41 (34)	7.4 - 190.0	NA - 44.0
Acenapthalene	1/111 (0.9)	NA - 110.0	ND
Acenaphthene	5/111 (5)	140.0 - 8,800.0	ND
Acetone	2/30 (6.7)	28.0 - 84.0	ND
Aldrin	3/41 (7)	18.0 - 75.0	ND
Alpha chlordane	1/37 (3)	NA - 630.0	ND
Anthracene	6/111 (5)	85.0 - 15,000	ND
Benzo(a)anthracene	27/111 (24)	84.0 - 26,000	NA - 87.0
Benzo(a)pyrene	24/111 (22)	79.0 - 24,000	ND
Benzo(b)fluoranthene	52/111 (47)	71.0 - 29,000	ND
Benzo(k)fluoranthene	13/111 (12)	74.0 - 29,000	ND
Benzo(g,h,i)perylene	17/111 (15)	76.0 - 9,500	ND
Bis(2 ethylhexyl)phthalate	8/30 (26.7)	78.0 - 2,800	NA - 78.0
Butyl benzylphthalate	5/30 (16.7)	88.0 - 4,800	ND
Chloroform	1/112 (1)	NA - 9.0	ND
Chloromethane	1/112 (1)	NA - 33.5	ND
Chrysene	43/111 (39)	84.0 - 25,000	NA - 9,600
Dibenzo(a,h)anthracene	3/111 (2)	380.0 - 4,900	ND
Dibenzofuran	3/30 (10)	250.0 - 3,200	ND
Dieldrin	1/41 (2)	NA - 18.0	ND

Dieldrin	1741 (2)	NA - 18.0	

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Table 7

CHEMICALS DETECTED IN SURFACE SOIL AT THE BURLINGTON NORTHERN RAIL YARD

	Frequency of Detection (Percent)	Concentration Range (µg/kg)	Background Concentration Range (µg/kg)
Organics (Cont.)			
Di-n-butyl phthalate	1/30 (3.3)	NA - 150.0	ND
Endrin ketone	3/41 (7)	28.0 - 62.0	ND
Fluoranthene	61/111 (55)	84.0 - 56,000	NA - 170
Fluorene	6/111 (5)	150.0 - 11,000	ND
Gamma chlordane	1/41 (2)	NA - 160.0	ND
Heptachlor	1/41 (2)	NA - 26.0	ND
Heptachlor epoxide	2/41 (5)	11.0 - 20.0	ND
Indeno (1,2,3-cd) pyrene	17/111 (15)	110.0 - 10,000	ND
Methoxychlor	1/41 (2)	NA - 160.0	ND
Methylene Chloride	24/109 (22)	10.5 - 1,497.0	NA - 10.5
Naphthalene	6/111 (5)	260.0 - 2,300	NA - 4,000
Phenanthrene	48/111 (43)	100.0 - 53,000	NA - 4,000
Pyrene	62/111 (56)	81.0 - 50,000	NA - 4,200
Tetrachloroethene	43/111 (39)	4.0 - 570.0	9.8 - 24.3
Toluene	26/112 (23)	5.0 - 570	ND
Trichloroethene	3/112 (3)	6.6 - 38.9	ND
Inorganics	**(Percent)**		**(mg/kg)**
Aluminum	30/30 (100)	2,710 - 22,200	8,580 - 14,700
Antimony	26/30 (86.7)	5.0 - 16.5	5.2 - 5.6
Arsenic	68/111 (61)	2.1 - 29.0	6.0 - 13.9
Barium	111/111 (100)	127.0 - 2,530.0	87 - 280
Beryllium	4/30 (13.3)	0.39 - 1.2	NA - 1.1
Cadmium	56/111 (50)	0.66 - 14.0	NA

Cadmium	56/111 (50)	0.66 - 14.0	NA
Calcium	30/30 (100)	3,510.0 - 97,900	7,420 - 19,400

Table 7

CHEMICALS DETECTED IN SURFACE SOIL AT THE BURLINGTON NORTHERN RAIL YARD

	Frequency of Detection (Percent)	Concentration Range (mg/kg)	Background Concentration Range (mg/kg)
Inorganics (Cont.)			
Chromium	111/111 (100)	4.0 - 220.0	7 - 34
Cobalt	24/30 (80)	5.3 - 15.3	6.2 - 12.7
Copper	30/30 (100)	9.0 - 1,890.0	27.8 - 41.6
Iron III	30/30 (100)	3,430 - 41,500	10,500 - 20,900
Lead	111/111 (100)	18.0 - 3,070.0	28 - 148
Magnesium	30/30 (100)	1,250 - 40,800	3,370 - 7,410
Manganese	30/30 (100)	78.1 - 654.0	226 - 414
Mercury	4/111 (3)	0.120 - 2.2	NA - 0.12
Nickel	29/30 (96.7)	4 - 35.3	16.2 - 27.4
Potassium	29/30 (96.7)	323 - 4,810	2,360 - 2,580
Selenium	19/111 (17)	0.27 - 0.69	ND
Silver	5/111 (5)	1 - 7	ND
Sodium	30/30 (100)	147 - 1,290	250 - 271
Thallium	2/30 (6.7)	0.26 - 0.29	NA - 0.29
Vanadium	30/30 (100)	7.5 - 49.3	22.6 - 49.3
Zinc	30/30 (100)	41.9 - 1,160	51.6 - 85.2

ND Not Detected
NA Not Available

[illegible]
[illegible] mm

TABLE 8

TPH Analytical Results (mg/L)

Ground Water Section
Livingston Rail Yard Remedial Investigation

WELL NO.	1989			1990				1991					1992	
	May-89	Aug	Nov	Feb-90	May	Aug	Nov	Feb-91	May	Aug	Sep***	Oct***	Nov	Feb-92	May
1		<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	0.1	<0.1			<0.1	0.4	<0.1
2		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	<0.1	<0.1
3	0.7	<0.1	<0.1		<0.1					<0.1			0.5	0.3	
4		<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	<0.1	<0.1
5	2.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	<0.1	<0.1
6	0.7	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	<0.1	<0.1
7	0.6	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	<0.1	<0.1
8	3	<0.1	<0.1		<0.1		<0.1	<0.1	<0.1	<0.1			<0.1	2.5	<0.1
11		<0.1	0.2		<0.1	<0.1				<0.1			<0.1		<0.1
L-87-1	0.8		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	<0.1	<0.1
L-87-2			10.5	1.3	1.1		1.2	4.3	1.2	<0.1	1	<0.1	0.7	2.8	
L-87-3	0.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	<0.1	<0.1
L-87-4	4.4	0.3	0.9	8.1	0.4	0.9	1.5	0.2	<0.1	<0.1			0.6	<0.1	<0.1
L-87-5	0.6	<0.1	<0.1	<0.1				<0.1		<0.1	<0.1			<0.1	
L-87-7		4.2	2	19	4.4	1.5	11.2	1.6	1.3	0.9	1.2	0.7	1.2	0.5	1.2
L-87-8	14.8	0.3	2	22.8	34	32	19.4	<0.1	222*	1.2	1	12.9	8.9	2.9	116
L-88-9	0.7	0.1	<0.1	<0.1	<0.1					<0.1					
L-88-10	0.6	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	<0.1	
L-88-11	0.9	0.2	<0.1	<0.1	<0.1					<0.1					
L-88-12	0.7	<0.1	<0.1	0.3	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1
L-88-13	2	<0.1	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	<0.1	<0.1
LS-6	9.9	0.2	<0.1		0.3	1.1	0.7	6	1.3	1.1			1.1	2.9	0.5
LS-7	4.2	0.9	<0.1	0.3	<0.1			0.3		<0.1				<0.1	
LS-8	0.8	0.1	<0.1	0.6	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	<0.1	<0.1
LS-10					<0.1	<0.1		<0.1		<0.1				<0.1	
LS-11	0.5	1.7	0.4	0.1	<0.1	1.5	0.4	<0.1	<0.1	0.5			0.6	<0.1	<0.1
DEPUY			<0.1												
BURNS			<0.1												
RAINBOW			<0.1	<0.1	<0.1	0.2			<0.1	<0.1					<0.1
POTW			<0.1	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			0.3	<0.1	<0.1
B-STR		**	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1
D-STR		<0.1				<0.1				<0.1					
L-STR		<0.1	<0.1	<0.1											
Q-STR		<0.1	<0.1	<0.1											
CLARENCE		<0.1	<0.1												
WERNER		<0.1	<0.1												
GEYSER TC				<0.1	<0.1	<0.1	0.5								
LG-10		<0.1		<0.1	<0.1	<0.1	<0.1	0.3	<0.1	<0.1			<0.1	<0.1	<0.1
89-1				4.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	<0.1	<0.1
89-2				<0.1	<0.1	<0.1	0.4	<0.1	<0.1	<0.1			<0.1	<0.1	<0.1
89-3				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	<0.1	<0.1
89-4				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	<0.1	<0.1
89-5						<0.1									
89-6				<0.1	<0.1		<0.1	<0.1	0.2	<0.1			<0.1	<0.1	<0.1
89-7				0.2	<0.1		<0.1	<0.1	0.3	<0.1			<0.1	<0.1	<0.1
89-8				0.4	<0.1					<0.1					
89-9				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	0.3	<0.1
89-10					<0.1			<0.1		<0.1				<0.1	
89-11					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	<0.1	<0.1
90-1B				0.4	<0.1					<0.1					
90-2B										<0.1					
90-3					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	<0.1	<0.1
90-4					<0.1					<0.1					
90-5					<0.1					<0.1					
90-6							<0.1		0.2						<0.1
92-1														<0.1	0.4
92-2															<0.1

RBCA Tier 1 ceiling concentration for TPH: 1 mg/l

* Sample contaminated due to bladder-pump failure
** Not sampled due to construction near well
*** Sampled during Pilot-Scale Hydrocarbon Recovery System Operation

TABLE 9

February 1995 Through November 2000
Apparent Free-Product Thickness Measurements
2000 Annual Ground Water Report

[feet]

Well	Feb-95	May-95	Aug-95	Nov-95	May-96	Nov-96	May-97	Nov-97	May-98	May-99	Jun-99	Sep-99	Nov-99	Jun-00	Nov-00
LB-4	0.12	0.45	0.65				0.66	0.42	0.28	0.39	0.40	0.47		0.09	
L-87-2	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	0.01	ND	ND	
L-87-4	ND	ND	0.19	0.1		0.39	0.98	0.68	0.11		0.03	0.02		ND	
L-87-6											0.01	ND			
L-87-7	0.78	0.24	0.65	0.7	0.24	0.46	0.9	0.48	0.33		0.55	0.67	ND	0.22	
L-87-8	1.35	0.12	0.31	0.27	0.11	0.4	0.24	0.23			0.01	0.07			0.40
L-88-13											<0.01	ND	ND	ND	
HRO-4								0.41							
HRO-6	0.63	0.36	0.52		0.65	0.74	0.43	0.7	0.37	0.34	0.04	0.14		0.04	
HRO-7							0.58	0.61	0.27	0.20	<0.01	0.23		0.01	
HRO-8			ND					Dry							
HRO-9	0.06				0.03		0.04	0.05	0.03	0.03	0.02	0.01		ND	
HRO-10	<0.01		<0.01		ND			<0.01							
HRO-11		0.23	ND												
HRO-12	<0.01	ND	ND		ND										
HRO-13	ND	ND	ND		ND										
HRO-14	ND	<0.01			ND										
HRO-15	0.07	<0.01													
HRO-16	0.5	0.04													
HRO-20	0.13	ND	0.06	0.16	0.03		ND	0.15							
HRO-21	<0.01	ND	ND	<0.01	ND		<0.01								
HRO-22	ND	<0.01	ND	0.01	ND		0.01	0.06							
HRO-23	ND	ND	ND		ND		ND	ND							
HRO-24	0.14	0.01	0.14	0.24	ND		0.03	0.17							
RW-1	ND	0.01			ND		ND			<0.01	0.01	ND			
RW-2	ND	<0.01			ND		ND			0.01	0.01	ND			
RW-3	0.03	<0.01					0.15			0.10	0.10	ND			
RW-4	ND	0.16			0.4		0.34			1.01	0.41	ND		0.75**	
RW-5	0.07	0.24													
RW-6	0.14*	0.22*			0.13		0.36			0.23	0.36	0.82		0.70**	
RW-7	0.4	0.04	0.19	0.25	ND	0.26	0.06	0.2	0.13	0.17	0.01	0.01			
RW-8	0.02	0.03	0.15	0.17			0.04			0.05	0.02	0.08			
RW-9	ND	ND	ND	0.01	ND	ND	ND	ND	ND	<0.01	0.01	0.01			
LG-11					ND									ND	
LG-12					ND										
95-1					ND	ND	ND				0.01	ND		ND	
LPZ-100	0.04							0.17							

Notes:

** - Approx. 15 gal product recovered from RW-4 in July; 70 gal product recovered from RW6 in July using intermittent belt skimmer
ND - No product detected
<0.01 - Trace of product detected but less than resolution of product probe's scale
* - Approximately 35 gallons of product recovered from Well RW-6 during December 1994

TABLE 10

Apparent Free-Product Thickness Measurements
August 1994 through May 1996
Livingston Rail Yard, Livingston, Montana
1996 Annual Groundwater Report

Well	Aug-94	Nov-94	Feb-95	May-95	Aug-95	Nov-95	May-96	Avg.
LS-7	0.09	Well abandoned in 12/94						0.09
LB-4	0.48	0.81	0.12	0.45	0.65			0.50
L-87-2	ND	ND	ND	ND	ND	ND	ND	N/A
L-87-4	0.11		ND	ND	0.19	0.1		0.13
L-87-7	0.3	0.68	0.78	0.24	0.65	0.7	0.24	0.51
L-87-8	0.43	0.15	1.35	0.12	0.31	0.27	0.11	0.39
HRO-6	0.25	0.56	0.63	0.36	0.52		0.65	0.50
HRO-8		0.21			ND			0.21
HRO-9	0.02		0.06				0.03	0.04
HRO-10		ND	<0.01		<0.01		ND	N/A
HRO-11		0.11		0.23	ND			0.17
HRO-12	ND	ND	<0.01	ND	ND		ND	N/A
HRO-13	ND	ND	ND	ND	ND		ND	N/A
HRO-14		ND	ND	<0.01			ND	N/A
HRO-15	0.06	0.07	0.07	<0.01				0.07
HRO-16	ND	0.09	0.5	0.04				0.21
HRO-20	ND	<0.01	0.13	ND	0.06	0.16	0.03	0.10
HRO-21	ND	<0.01	<0.01	ND	ND	<0.01	ND	N/A
HRO-22	<0.01	<0.01	ND	<0.01	ND	0.01	ND	0.01
HRO-23	<0.01	<0.01	ND	ND	ND		ND	N/A
HRO-24	ND	0.08	0.14	0.01	0.14	0.24	ND	0.12
RW-1		<0.01	ND	0.01			ND	0.01
RW-2		<0.01	ND	<0.01			ND	N/A
RW-3		0.04	0.03	<0.01				0.04
RW-4		0.16	ND	0.16			0.04	0.24
RW-5		0.09	0.07	0.24				0.13
RW-6		1.07	0.14*	0.22*			0.13	0.60
RW-7	0.04	0.02	0.4	0.04	0.19	0.25	ND	0.16
RW-8	<0.01	0.01	0.02	0.03	0.15	0.17		0.08
RW-9	ND	ND	ND	ND	ND	0.01	ND	0.01
LG-11							ND	N/A
LG-12							ND	N/A
95-1							ND	N/A
LPZ-100		0.09	0.04					0.07

Notes:
ND - no product detected
<0.01 - Trace of product detected but less than resolution of product probe
* - Approximately 35 gallons of product recovered from Well RW-6 during December 1994

TABLE 11

PM-10 Results vs. Ambient Standards

Air Section
Livingston Rail Yard Remedial Investigation

	Standard	Upwind Site	Downwind Site
Mean	50*	18	16
Peak	150**	56	34

Units: $\mu g/m^3$
* Annual mean
** Not to be exceeded more than once per year

TABLE 12

Mean PAH Concentrations

Air Section
Livingston Rail Yard Remedial Investigation

Compound	Concentration (μ/m^3)
Acenaphthene	0.0039
Acenaphthylene	0.0033
Anthracene	0.0034
Benzo(a)anthracene	<0.0032
Benzo(a)pyrene	<0.0032
Benzo(b)fluoranthene	0.0037
Benzo(ghi)perylene	<0.0032
Benzo(k)fluoranthene	<0.0032
Chrysene	0.0032
Dibenzo(a,h)anthracene	<0.0032
Fluoranthene	0.0052
Fluorene	0.0076
Indeno(1,2,3-cd)pyrene	<0.0032
Naphthalene	0.0052
Phenanthrene	0.0193
Pyrene	0.0044

TABLE 13

Mean Elemental Results

Air Section
Livingston Rail Yard Remedial Investigation

Element	Upwind ($\mu g/M^3$)	Downwind ($\mu g/M^3$)
Aluminum	ND	ND
Antimony	0.021	0.020
Arsenic	0.001	0.006
Barium	0.010	0.015
Bromine	0.003	0.013
Cadmium	0.008	0.024
Calcium	1.381	1.223
Chlorine	ND	0.174
Chromium	0.000	ND
Copper	0.004	0.004
Gallium	ND	ND
Germanium	0.001	0.001
Indium	0.016	0.013
Iron	0.406	0.161
Lanthanum	0.188	0.086
Lead	0.005	0.070
Manganese	0.007	0.004
Mercury	ND	ND
Molybdenum	0.106	0.106
Nickel	ND	ND
Palladium	0.015	0.003
Phosphorous	ND	ND
Potassium	0.389	0.419
Rubidium	0.003	0.004
Selenium	0.001	ND
Silver	0.010	0.004
Strontium	0.014	0.013
Sulphur	0.130	0.042
Tin	0.018	0.022
Titanium	0.050	0.046

Vanadium	0.001	0.002
Yttrium	0.003	0.002
Zinc	ND	0.089
Zirconium	0.018	0.017

TABLE 14

Analytical Results for Indoor and Outdoor Air Samples Collected during February 1992

Air Section
Livingston Rail Yard Remedial Investigation

Study Area	Resident	Location	Sampler Number	Sample Type	Standard Volume	PCE (µg/m3)	TCE (µg/m3)	cis-1,2-DCE (µg/m3)	trans-1,2-DCE (µg/m3)
Background	BG-1	Basement	90	Primary	2.69	1.12	<0.19	<0.19	<0.19
Background	BG-1	Upstairs	64	Primary	2.61	1.19	<0.19	<0.19	<0.19
Background	BG-2	Basement	29	Primary	3.09	1.36	0.36	<0.16	<0.16
Background	BG-2	Upstairs	82	Primary	2.64	1.44	1.06	<0.19	<0.19
Background	BG-3	Basement	10	Primary	2.85	1.33	<0.18	<0.18	<0.18
Background	BG-3	Upstairs	119	Primary	2.66	1.47	0.19	<0.19	<0.19
Background	BG-3	Outdoor	120	Primary	2.72	1.47	<0.18	<0.18	<0.18
Background	BG-4	Basement	041-N	Primary	3.15	1.94	0.25	<0.16	<0.16
Background	BG-4	Upstairs	127-N	Primary	2.64	2.54	0.3	<0.19	<0.19
Background	BG-5	Basement	50	Primary	2.96	0.61	2.71	<0.17	<0.17
Background	BG-5	Upstairs	32	Primary	2.87	0.56	1.11	<0.17	<0.17
Northeast	NE-1	Basement	85	First Time	2.91	64.3	1.07	0.24	<0.17
Northeast	NE-1	Basement	043-N	Primary	3.02	70.2	1.42	0.4	<0.17
Northeast	NE-1	Outdoor	021-N	Primary	2.23	1.52	<0.22	<0.22	<0.22
Northeast	NE-2	Basement	5	Primary	2.69	18.9	0.45	<0.19	<0.19
Northeast	NE-2	Basement	89	Duplicate	2.62	17.2	0.31	<0.19	<0.19
Northeast	NE-2	Upstairs	43	Primary	2.48	5.73	0.24	<0.20	<0.20
Northeast	NE-3	Basement	51	Primary	2.63	8.56	1.98	<0.19	<0.19
Northeast	NE-3	Upstairs	83	Primary	2.67	13.7	3.33	<0.19	<0.19
Southeast	SE-1	Basement	104	Primary	2.69	3.35	<0.19	<0.19	<0.19
Southeast	SE-1	Upstairs	93	Primary	2.48	27	0.77	<0.20	<0.20
Southeast	SE-1	Upstairs	102	Duplicate	1.90	24.6	0.68	<0.26	<0.26
Southeast	SE-2	Basement	058-N	Primary	2.68	6.31	0.3	0.26	<0.19
Southeast	SE-2	Basement	014-N	Duplicate	2.62	6.87	0.31	0.27	<0.19
Southeast	SE-2	Upstairs	082-N	Primary	2.67	5.47	0.3	0.26	<0.19
Southeast	SE-3	Basement	66	Primary	2.73	1.39	0.22	<0.18	<0.18
Southeast	SE-3	Upstairs	52	Primary	2.73	1.43	<0.18	<0.18	<0.18
Southeast	SE-4	Basement	015-N	Primary	2.92	2.19	<0.17	<0.17	<0.17
Southeast	SE-4	Upstairs	58	First Time	2.71	3.84	1.62	<0.18	<0.18
Southeast	SE-4	Upstairs	094-N	Primary	2.81	5.2	1.71	<0.18	<0.18
Southeast	SE-5	Basement	001-N	Primary	3.15	43.2	2.35	<0.16	<0.16
Southeast	SE-5	Basement	030-N	Duplicate	2.14	51.4	1.45	<0.23	<0.23
Southeast	SE-5	Upstairs	117-N	Primary	2.22	11.3	0.9	<0.23	<0.23
Southeast	SE-6	Basement	47	Primary	2.73	1.4	0.22	<0.18	<0.18
Southeast	SE-6	Upstairs	26	Primary	2.77	1.63	0.22	<0.18	<0.18
Southeast	SE-7	Basement	19	Primary	2.80	1.11	0.21	<0.18	<0.18
Southeast	SE-7	Upstairs	14	Primary	2.12	1.23	<0.24	<0.24	<0.24

Southeast	SE-8	Basement	35	Primary	2.73	<1.83	0.29	0.22	0.22
Southeast	SE-8	Upstairs	61	Primary	2.64	1.02	0.49	0.23	<0.19
Southeast	SE-8	Upstairs	67	Duplicate	1.62	0.93	0.49	<0.31	<0.31

TABLE 15

Analytical Results for Indoor Air and Soil Gas Samples Collected During March 1992

Air Section
Livingston Rail Yard Remedial Investigation

Study Area	Resident	Location	Sampler Number	Sample Type	Standard Volume	PCE (µg/m3)	TCE (µg/m3)	cis-1,2-DCE (µg/m3)	trans-1,2-DCE (µg/m3)
Background	BG-2	Soil Gas	106-V	Primary	1.28	14.4	5	<0.39	<0.39
Background	BG-2A	Soil Gas	114-V	Primary	1.32	12.8	9.24	<0.38	<0.38
Northeast	NE-1	Basement	003-S	Primary	3.07	82.1	1.5	0.26	<0.16
Northeast	NE-1	Upstairs	125-S	Primary	2.82	27.9	0.6	<0.18	<0.18
Northeast	NE-1	Upstairs	065-S	Duplicate	2.96	26.5	0.61	<0.17	<0.17
Northeast	NE-3	Soil Gas	121-S	Primary	0.67	1.34	<0.75	<0.75	<0.75
Northeast	NE-3	Soil Gas	017-S	Duplicate	0.09	<5.56	<5.56	<5.56	<5.56
Northeast	NE-4	Basement	025-S	Primary	2.48	18.4	0.48	NI	NI
Northeast	NE-4	Upstairs	020-S	Primary	3.16	5.66	0.57	<0.16	<0.16
Northeast	NE-4	Upstairs	009-S	Duplicate	2.54	6.18	1.3	0.63	0.39
Northeast	NE-5	Basement	061-S	Primary	2.43	0.58	<0.21	<0.21	<0.21
Northeast	NE-5	Upstairs	050-S	Primary	3.07	1.07	0.23	<0.16	<0.16
Southeast	SE-2	Soil Gas	080-S	Primary	0.66	9.09	9.55	<0.76	<0.76
Southeast	SE-2	Soil Gas	069-S	Duplicate	0.09	5.56	<5.56	<5.56	<5.56

NI - No information due to water interference in sampler tube

Table 16

STATISTICAL SUMMARY FOR CHEMICALS DETECTED IN INDOOR AIR

Chemical	Frequency of Detection	Minimum ($\mu g/m^3$)	Maximum ($\mu g/m^3$)	Background Concentration Range ($\mu g/m^3$)
STATISTICAL SUMMARY FOR DATA COLLECTED IN 1992				
Tetrachloroethene	38/39	1.02	82.1	0.61 - 2.54
Trichloroethane	36/39	0.15	9.55	0.3 - 2.71
Cis-1,2 Dichloroethene	9/38	0.22	0.36	ND
Trans-1,2 Dichloroethene	1/38	NA	0.22	ND
Vinyl chloride	1/4	NA	0.80	ND
STATISTICAL SUMMARY FOR DATA COLLECTED IN 1993				
Tetrachlorethene	13/62	1.3	19.0	0.1 - 10.2

ND = Not Detected
NA = Not Applicable

TABLE 17

Vinyl Chloride Analytical Results for Indoor Air and Soil Gas Samples Collected During March 1992

Air Section
Livingston Rail Yard Remedial Investigation

Study Area	Resident	Location	Sampler Number	Sample Type	Standard Volume	Vinyl Chloride (µg/m3)
Background	BG-2	Basement	107-V	Primary	9.09	<0.02
Northeast	NE-1	Basement	109-V	Primary	8.33	<0.02
Northeast	NE-1	Basement	004-V	Duplicate	6.01	<0.03
Northeast	NE-1	Soil Gas	045-V	Primary	1.33	<0.15
Southeast	SE-2	Basement	077-V	Primary	8.12	0.8
Southeast	SE-2	Basement	055-V	Duplicate	4.20	0.64
Southeast	SE-5	Soil Gas	048-V	Primary	1.32	<0.15
Southeast	SE-8	Basement	112-V	Primary	8.94	<0.02

TABLE 18

January/February 1993 Sample Results

Air Section
Livingston Rail Yard Remedial Investigation

Location	Sample No.	Upstairs/ Basement	PCE Concentration (µg/M^3)	Method	Sampling Dates
AMB-1	# 103		<0.2	Berkeley	1/27/1993 (1/15 to 2/5)
AMB-2	# 008		10.2	Berkeley	1/27/1993 (1/15 to 2/5)
AMB-3	# 032		4.7	Berkeley	1/27/1993 (1/15 to 2/5)
AMB-4	# 118		1.0	Berkeley	1/27/1993 (1/15 to 2/5)
NE-2	WK 4798	upstairs	<2.7	passive dos.	1/14 to 2/5
NE-2	WK 4861	basement	8.5	passive dos.	
NE-6	WK 4749	upstairs	<4.2	passive dos.	1/13 to 1/27
NE-6	WK 4199	basement	<4.2	passive dos.	
NE-7	WK 4476	upstairs	<4.2	passive dos.	1/12 to 1/26
NE-7	WK 4581	basement	<4.2	passive dos.	
NE-8	WK 4850	upstairs	<4.5	passive dos.	1/12 to 1/26
NE-9	WK 4786	upstairs	<4.2	passive dos.	1/12 to 1/26
NE-9	WK 4698	dirt dugout	<4.2	passive dos.	
NE-10	WD 6096	upstairs	<4.2	passive dos.	1/12 to 1/26
NE-10	WK 6060	dirt dugout	17.4	passive dos.	
NE-11	WD 5788	upstairs	<4.2	passive dos.	1/11 to 1/25
NE-12	WK 4500	upstairs	<4.2	passive dos.	1/12 to 1/26
NE-12	WK 4661	basement	<4.2	passive dos.	
NE-13	WK 4474	upstairs	<4.2	passive dos.	1/12 to 1/26
NE-13	WK 4510	basement	<4.2	passive dos.	
NE-14	WK 4218	trailer	<4.2	passive dos.	1/13 to 1/27
NE-14	WK 4195	skirting	<4.2	passive dos.	
NE-15	WK 4662	upstairs	<4.2	passive dos.	1/13 to 1/27
NE-15	WK 4632	basement	<4.2	passive dos.	
NE-16	WK 4695	upstairs	19.0	passive dos.	1/12 to 1/26
NE-16	WK 4818	basement	14.0	passive dos.	
NE-17	WK 4651	upstairs	10.0	passive dos.	1/13 to 1/27
NE-17	WK 4445	basement	18.9	passive dos.	
NE-18	WK 4422	upstairs	<4.2	passive dos.	1/12 to 1/26

Location	Sample No.	Upstairs/ Basement	PCE Concentration (µg/M^3)	Method	Sampling Dates
NE-18	WK 4536	basement	<4.2	passive dos.	
NE-19	WK 4755	upstairs	<4.2	passive dos.	1/12 to 1/26
NE-20	WK 4857	upstairs	8.7	passive dos.	1/22 to 2/5
NE-20	WK 4683	dirt dugout	8.2	passive dos.	
SE-5	WK 4847	upstairs	<4.2	passive dos.	1/12 to 1/26
SE-5	WK 4682	crawlspace	5.2	passive dos.	
SE-10	WK 4833	upstairs	<4.2	passive dos.	1/13 to 1/27
SE-10	WK 4828	basement	<4.2	passive dos.	
SE-11	WK 4245	upstairs	<4.5	passive dos.	1/13 to 1/26
SE-11	WK 4181	basement	<4.5	passive dos.	
SE-12	WD 5991	upstairs	<4.2	passive dos.	1/11 to 1/25
SE-12	WD 5847	basement	<4.2	passive dos.	
SE-14	WK 4573	upstairs	<4.2	passive dos.	1/12 to 1/26
SE-14	WK 4423	basement	<4.2	passive dos.	
SE-15	WD 6221	split level-up	<4.2	passive dos.	1/11 to 1/25
SE-15	WD 6111	basement	<4.2	passive dos.	
SE-16	WK 4750	upstairs	<4.2	passive dos.	1/12 to 1/26
SE-17	WK 4649	upstairs	4.5	passive dos.	1/13 to 1/26
SE-17	WK 4878	crawlspace	5.0	passive dos.	
SE-18	WD 5757	upstairs	15.7	passive dos.	1/11 to 1/25
SE-18	WD 6203	crawlspace	<4.2	passive dos.	
SE-19	WK 4671	upstairs	<4.2	passive dos.	1/12 to 1/26
SE-19	WK 4589	crawlspace	<4.2	passive dos.	
SE-20	WK 4827	upstairs	<4.2	passive dos.	1/13 to 1/27
SE-21	WD 6092	upstairs	<4.2	passive dos.	1/11 to 1/25
SE-22	WK 4438	trailer	<4.5	passive dos.	1/13 to 1/26
SE-23	WK 4168	upstairs	<4.2	passive dos.	1/13 to 1/27
SE-24	WK 4600	upstairs	6.8	passive dos.	1/12 to 1/26
SE-24	WK 4593	crawlspace	<4.2	passive dos.	
SE-25	WK 4635	upstairs	<4.2	passive dos.	1/12 to 1/26
SE-26	WK 4242	upstairs	<4.5	passive dos.	1/13 to 1/26
SE-26	WK 4303	crawlspace	<4.5	passive dos.	
SE-27	WK 4456	upstairs	<4.2	passive dos.	1/12 to 1/26
SE-27	WK 4766	basement	<4.2	passive dos.	
SE-28	WK 4688	upstairs	<4.2	passive dos.	1/13 to 1/27

Location	Sample No.	Upstairs/ Basement	PCE Concentration (µg/M^3)	Method	Sampling Dates
SE-28	WK 4831	crawlspace	<4.2	passive dos.	
SE-29	WK 4606	trailer	<4.2	passive dos.	1/13 to 1/27
U-2	WK 4721	upstairs	<4.2	passive dos.	1/12 to 1/26
U-2	WK 4641	basement	<4.2	passive dos.	

TABLE 19

Frequency of Occurrence of VOCs in the Livingston Aquifer

Ground Water Section
Livingston Rail Yard Remedial Investigation

CHEMICAL	NO. OF DETECTIONS	NO. OF ANALYSES	PERCENT DETECTED	DETECTION LIMIT (µg/L)	MINIMUM CONCENTRATION (µg/L)	MAXIMUM CONCENTRATION (µg/L)	MCL* (µg/L)
Tetrachloroethene	402	677	59.4	0.5	0.5	850	5
Trichloroethene	319	677	47.1	0.5	0.5	73	5
cis-1,2-Dichloroethene	286	677	42.2	1	1	2550	70
Chlorobenzene	93	677	13.7	1	1	2100	100
trans-1,2-Dichloroethene	71	677	10.5	1	1	31	100
1,4-Dichlorobenzene	69	677	10.2	1	0.5	150	75
1,2-Dichlorobenzene	46	677	6.8	1	1	88	60
2-Chlorotoluene	44	676	6.5	1	1	190	N/A
Naphthalene	28	538	5.2	1	1.2	45	N/A
Isopropylbenzene	27	539	5	1	1	6.9	N/A
sec-Butylbenzene	26	539	4.8	1	1	5.5	N/A
Ethylbenzene	21	542	3.9	1	1	11	700
Vinyl Chloride	21	677	3.1	0.5	0.5	2.2	2
n-Propylbenzene	19	539	3.5	1	1	5.5	N/A
1,2,4-Trimethylbenzene	15	539	2.8	1	1	12	N/A
o-Xylene	15	310	4.8	1	1	7.7	N/A
Benzene	12	542	2.2	0.5	0.52	1.2	5
1,3-Dichlorobenzene	11	677	1.6	1	1	16	N/A
Total Xylenes	11	232	4.7	1	1	9.9	10000
n-Butylbenzene	8	539	1.5	1	1.5	7.2	N/A
1,3,5-Trimethylbenzene	7	538	1.3	1	1	3.6	N/A
Chloroform	6	677	0.9	1	1	4.6	N/A
1,1-Dichloroethene	6	677	0.9	0.5	0.5	13	N/A
p-Isopropyltoluene	5	539	0.9	1	1	2	N/A
Toluene	4	542	0.7	1	1	1.4	N/A
Trichlorofluoromethane	4	677	0.6	1	1.3	7.9	1000
tert-Butylbenzene	3	539	0.6	1	1.8	4.6	N/A
m+p Xylene	3	55	5.5	1	1.7	3.8	N/A
1,1,1-Trichloroethane	3	677	0.4	0.5	0.5	0.85	200
Bromodichloromethane	2	677	0.3	1	1	2.6	N/A
Bromoform	2	677	0.3	1	2.4	2.5	N/A
Dibromochloromethane	2	677	0.3	1	2.1	4.8	N/A

*MCL = Maximum Contaminant Level (40 CFR 141.61)
N/A = Not applicable

TABLE 20

VOC* Results From Livingston Municipal Wells
April 1988 - May 1992

Ground Water Section
Livingston Rail Yard Remedial Investigation

SAMPLE DATE	WELL LOCATION					
	B ST	D ST	L ST	Q ST	CLARENCE ST	WERNER ST
Apr-88		PCE 0.45µg/l				
Feb-89		PCE 0.16µg/l				
May-89			N/D	PCE 0.66 µg/l		
Jun-89						
Jul-89						
Aug-89		N/D	N/D	PCE 0.95µg/l	N/D	N/D
Sep-89	N/D	N/D				
Oct-89	N/D					
Nov-89	N/D		N/D	PCE 0.71 µg/l	N/D	N/D
Dec-89	N/D					
Jan-90	N/D					
Feb-90	N/D		N/D	PCE 0.5 µg/l		
Mar-90	N/D					
Apr-90	N/D	N/D				
May-90	N/D	N/D	N/D	PCE 0.76 µg/l		
Jun-90	**					
Jul-90	N/D					
Aug-90	N/D	N/D				
Sep-90	N/D					
Oct-90	N/D					
Nov-90	N/D					
Dec-90	N/D					
Jan-91	N/D					
Feb-91	N/D					
Mar-91	**					
Apr-91	N/D					
May-91	N/D					
Jun-91	N/D					
Jul-91	N/D					
Aug-91	N/D					
Sep-91	**					
Oct-91	**					
Nov-91	**					
Dec-91	**					
Jan-92	**					
Feb-92	**					
Mar-92	N/D					
Apr-92	N/D					
May-92	N/D					

Notes: All analyses were conducted according to EPA Method 524.2
N/D - No Method 524.2 analytes detected
* Trihalomethane detections not included
** Well not sampled because it was not operating

TABLE 21

Summary of Analytical Results From Private Wells

Ground Water Section
Livingston Rail Yard Remedial Investigation

WELL[1] OWNER	SAMPLE NO.	SAMPLE DATE	VOCs (µg/L)	TPHs (mg/L)	METALS (mg/L)	SEMIVOLATILES	PCBs/ PESTICIDES
	140102-003	07/25/89	N/D	N/A	N/A	N/A	N/A
	140101-200	11/17/89	N/D	N/D	N/A	N/A	N/A
	140102-013	08/01/89	Chloroform 1.2 PCE 7.6 TCE 1.7	N/A	N/A	N/A	N/A
	140102-014	08/01/89	Chloroform 1.2 PCE 7.3 TCE 1.8	N/A	N/A	N/A	N/A
	140101-195	11/18/89	PCE 7.2 TCE 1.3	N/D	N/A	N/A	N/A
	140102-002	07/25/89	N/D	N/A	N/A	N/A	N/A
	140102-001	07/25/89	N/D	N/A	N/A	N/A	N/A
	140101-268	02/20/90	N/D	N/D	Arsenic 0.015	N/D	N/D
	140101-448	06/06/89	N/D	N/D	N/A	N/A	N/A
	140101-536	08/28/89	N/D	N/D	N/A	N/A	N/A
	140101-587	11/28/90	N/D	0.5	N/A	N/A	N/A
	140102-015	08/01/89	N/D	N/A	N/A	N/A	N/A
	140102-005	07/26/89	PCE 0.64	N/A	N/A	N/A	N/A
	140102-011	08/01/89	PCE 11.0 TCE 0.6	N/A	N/A	N/A	N/A
	140102-007	07/31/89	N/D	N/A	N/A	N/A	N/A
	140101-429	05/30/90	cis-1,2-DCE 2.1 PCE 26.0 TCE 0.84	N/A	N/A	N/A	N/A
	140102-010	07/31/89	N/D	N/A	N/A	N/A	N/A
	140102-016	08/01/89	N/D	N/A	N/A	N/A	N/A
	140101-023	05/26/89	cis-1,2-DCE 8.9 PCE 35 TCE 5.2	N/A	N/A	N/A	N/A
	140101-024	05/26/89	cis-1,2-DCE 7.3 PCE 34 TCE 5.1	N/A	N/A	N/A	N/A
	140101-194	11/18/89	Chlorobenzene 3.5 cis-1,2-DCE 64 PCE 64 TCE 12	N/D	N/A	N/A	N/A
	140101-271	02/20/90	cis-1,2-DCE 27 PCE 35 TCE 6.6	N/D	N/D	N/D	N/D
	140101-419	05/29/90	cis-1,2-DCE 16 PCE 24 TCE 4.7	N/D	N/A	N/A	N/A
	140101-537	08/28/90	Chlorobenzene 1.3 cis-1,2-DCE 99 PCE 96 TCE 15	0.2	N/A	N/A	N/A
	140101-753	05/31/91	cis-1,2-DCE 7.9 PCE 19 TCE 3.1	N/D	N/A	N/A	N/A
	140102-009	07/31/89	N/D	N/A	N/A	N/A	N/A
	140102-006	07/26/89	PCE 0.81	N/A	N/A	N/A	N/A
	140102-004	07/25/89	N/D	N/A	N/A	N/A	N/A

[1] Names omitted to respect privacy

N/A - Not analyzed
N/D - Not detected

TABLE 21 (cont.)

Dissolved Metal Results (August 1989 through August 1990)

DATE	LOCATION	METALS (mg/l)							
		Arsenic	**Barium**	**Cadmium**	**Chromium**	**Lead**	**Mercury**	**Selenium**	**Silver**
MCL		***0.05***	***1.0***	***0.01***	***0.1***	***0.05***	***0.002***	***0.05***	***0.05***
8/24/89	Well L-87-1	<0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
9/20/90	Private Well	<0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
9/20/90	Private Well	<0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
9/20/90	Private Well	<0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
3/16/90	Well 89-9	<0.005	<0.1	0.002	<0.02	0.02	<0.001	<0.005	0.02
8/29/90	Private Well	<0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
8/29/90	Private Well	<0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005

TABLE 21 (cont.)

Dissolved Metal Results (February 1990)

WELL NO.	METALS (mg/l)							
	Arsenic	**Barium**	**Cadmium**	**Chromium**	**Lead**	**Mercury**	**Selenium**	**Silver**
MCL	***0.05***	***1.0***	***0.01***	***0.1***	***0.05***	***0.002***	***0.05***	***0.05***
2	<0.005	<0.1	<0.001	<0.02	0.02	<0.001	<0.005	<0.005
4	<0.005	<0.1	<0.001	<0.02	0.02	<0.001	<0.005	<0.005
5	<0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
6	<0.005	<0.1	0.004	<0.02	<0.01	<0.001	<0.005	<0.005
7	<0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
L-87-1	<0.005	<0.1	0.004	<0.02	<0.01	<0.001	<0.005	<0.005
L-87-2	<0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
L-87-3	<0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
L-87-4	<0.005	<0.1	<0.001	<0.02	0.02	<0.001	<0.005	<0.005
L-87-5	<0.005	<0.1	0.004	<0.02	<0.01	<0.001	<0.005	<0.005
L-87-7	<0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
L-87-8	<0.005	<0.1	0.001	<0.02	<0.01	<0.001	<0.005	<0.005
L-88-9	<0.005	<0.1	<0.001	<0.02	0.01	<0.001	<0.005	<0.005
L-88-10	<0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
L-88-11	<0.005	<0.1	0.003	<0.02	<0.01	<0.001	<0.005	<0.005
L-88-12	<0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
L-88-13	<0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
LS-7	<0.005	<0.1	<0.001	<0.02	0.02	<0.001	<0.005	<0.005
LS-8	0.006	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
LS-11	0.005	<0.1	0.004	<0.02	0.01	<0.001	<0.005	<0.005
RAINBOW	<0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
POTW	<0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
B-STR	<0.005	<0.1	0.001	<0.02	0.01	<0.001	<0.005	<0.005
L-STR	0.009	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
Q-STR	0.006	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
GEYSER TC	0.015	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
LG-10	<0.005	<0.1	0.003	<0.02	<0.01	<0.001	<0.005	<0.005
89-1	<0.005	<0.1	<0.001	<0.02	0.01	<0.001	<0.005	<0.005
89-2	<0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
89-3	<0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
89-4	<0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
89-6	<0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
89-7	<0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
89-8	<0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
90-1	<0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005

TABLE 22

Dissolved Metal Results (May 1989)

Ground Water Section
Livingston Rail Yard Remedial Investigation

WELL NO.	METALS (mg/l)							
	Arsenic	**Barium**	**Cadmium**	**Chromium**	**Lead**	**Mercury**	**Selenium**	**Silver**
MCL*	***0.05***	***1.0***	***0.01***	***0.1***	***0.05***	***0.002***	***0.05***	***0.05***
WQB-7	.020	2.000	0.005	0.1	0.015	0.002	0.05	0.035
3	<0.005	0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
5	<0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
6	0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
7	<0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
8	<0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
L-87-1	<0.005	<0.1	<0.001	<0.02	0.02	<0.001	<0.005	<0.005
L-87-3	<0.005	<0.1	0.003	<0.02	<0.01	<0.001	<0.005	<0.005
L-87-4	<0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
L-87-5	<0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
L-87-8	<0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
L-88-9	<0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
L-88-10	<0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
L-88-11	0.005	<0.1	<0.001	<0.02	0.01	<0.001	0.006	<0.005
L-88-12	<0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
L-88-13	<0.005	<0.1	0.002	<0.02	<0.01	<0.001	<0.005	<0.005
LS-6	<0.005	0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
LS-7	<0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
LS-8	0.005	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005
LS-11	0.007	<0.1	<0.001	<0.02	<0.01	<0.001	<0.005	<0.005

* Maximum contaminant level

TABLE 23

Summary of Analytical Results
Yellowstone River Gravel and Sediment

Soil Section
Livingston Rail Yard Remedial Investigation

SAMPLE NUMBER	LOCATION	SAMPLE DEPTHS	ANALYTICAL METHOD*	CONSTITUENTS DETECTED	
				Organics	Total Priority Metals
140101-SO-056	RG-56	2"	A	N/D	N/A
140101-SO-057	RG-57	1.5'	A	2-Chlorotoluene 21 ppm m+p-Xylenes 0.018 ppm o-Xylenes 0.014 ppm	N/A
140101-SO-058	RG-58	0"	F	TPH 325 ppm	N/A
140101-SO-060	SS-060	0"	A, C, D, F, H	TPH 425 ppm Toluene 0.011 ppm	Arsenic 8 ppm Barium 55 ppm Chromium 9 ppm Lead 5 ppm
140101-SO-061	SS-061	0"	A, C, D, F, H	TPH 45 ppm Toluene 0.022 ppm	Arsenic 8 ppm Barium 130 ppm Chromium 16 ppm Lead 6 ppm
140101-SO-062 Dup. of SO-061	SS-062	0"	A, C, D, F, H	TPH 40 ppm Toluene 0.019 ppm	Arsenic 13 ppm Barium 120 ppm Chromium 14 ppm Lead 6 ppm
140101-SO-063	SS-063	0"	A, c, D, F, H	TPH 185 ppm Toluene 0.008 ppm	Arsenic 13 ppm Barium 46 ppm Chromium 5 ppm
140101-SO-064	SS-064	0"	A, C, D, F, H	TPH 90 ppm Toluene 0.008 ppm	Arsenic 12 ppm Barium 57 ppm Chromium 8 ppm
140101-SO-296	TP-158	3'	A, F	TPH <10 ppm	N/A
140101-SO-297	TP-166	3.5'	A, F	TPH <10 ppm	N/A
140101-SO-298	TP-169	4'	A, C, F	TPH <10 ppm	N/A
140101-SO-299	TP-171	4'	A, F	TPH <10 ppm	N/A

* Refers to EPA analytical method (see Table 5.16 in RI)

TABLE 24

Yellowstone River Water Sample Results

Ground Water Section
Livingston Rail Yard Remedial Investigation

SAMPLE LOCATION	SAMPLE NO.	SAMPLE DATE	VOCs (ppb)	TPHs (ppm)	SEMIVOLATILES	PCBs/ PESTICIDES	METALS*
9th St. Bridge	140101-116	9/20/89	N/D	0.1	N/A	N/A	Arsenic 0.024**
Calvary Cemetary	140101-323	3/21/90	N/D	N/D	N/D	N/D	Arsenic 0.028
Ruggles Residence	140101-324	3/21/90	N/D	N/D	N/D	N/D	Arsenic 0.028
Ruggles Residence	140101-325	3/21/90	N/D	N/A	N/A	N/A	N/A
Livingston Golf Course	140101-326	3/21/90	N/D	N/D	N/D	N/D	Arsenic 0.028
Hwy. 89 Bridge	140101-327	3/21/90	N/D	N/D	N/D	N/D	Arsenic 0.014
100 yds downstream from POTW	140101-328	3/21/90	PCE 0.91 2-Chlorotoluene 0.98	1.9	N/D	N/D	Arsenic 0.015 Cadmium 0.002
POTW Discharge	140101-329	3/21/90	PCE 1.6 2-Chlorotoluene 1.7	N/A	N/A	N/A	N/A

* Total metals unless otherwise noted
** Dissolved metals

Notes: N/A - Not analyzed
N/D - No detection

TABLE 25

Volume of Contaminated Soil Removed at each Tank Location

Tank Number	Volume of Contaminated Soil Removed (cubic yards)
2	12
3 and 4	160
6	10
7	0
8	60
9-A	4
9-B	0
10 and 11	60
12	0
13	120
14, 15, 16, 17[1]	230
18	60
Total 13	716

[1] These aboveground tanks are located in one area. The contamination associated with these tanks originated from piping or surface spills.

TABLE 26

Chemicals of Concern for Human Health

Groundwater	Surface Soil	Indoor Air	Sediment
Chlorobenzene	Benzo(a)pyrene	Cis-Dichloroethene	2-Chlorotoluene
2-Chlorotoluene	Benzo(b)fluoranthene	Trans-Dichloroethene	
1,4 Dichlorobenzene	Benzo(k)fluoranthene	Tetrachloroethene	
cis-1,2 Dichloroethene	Chrysene	Trichloroethene	
Methylene Chloride	Dibenz(a,h)anthracene	Vinyl Chloride	
Tetrachloroethene	Indeno(1,2,3-cd)pyrene		
Trichloroethene	Lead		
Vinyl Chloride			

TABLE 27

Potential Pathways Of Exposure In The Vicinity Of The Livingston Rail Yard, Montana

Medium of Concern	Potential Exposure Pathway	Pathway Likely to be Currently Complete?	Pathway Potentially Complete in the Future?	Exposure to be Quantitatively Evaluated	Pathway Evaluated Quantitatively for Current or Future Exposures?
Groundwater	Ingestion of contaminated groundwater from a domestic or municipal well.	No	Yes	Yes. The alluvial aquifer is currently being used as a drinking water source and there is no ordinance which would prevent a private citizen in the county from placing a well within the contaminant plume downgradient from the Site.	Future
	Dermal exposure of contaminated groundwater.	No	Yes	Yes. Dermal contact with groundwater is possible during showering and bathing if water from the contaminated plume is used.	Future
	Dermal exposure to groundwater during irrigation.	Yes	Yes	Potentially contaminated groundwater is currently used for irrigation. A screening analysis showed, however, that the pathway is not likely to significantly contribute to overall risk.	NA
	Inhalation of volatile chemicals in groundwater during irrigation.	Yes	Yes	Potentially contaminated groundwater is currently used for irrigation. A screening analysis showed, however, that the pathway is not likely to significantly contribute to overall risk.	NA
Surface Soils	Incidental ingestion of chemicals in surface soils	Yes	Yes	Yes. Surface soils on the Site are contaminated, and incidental ingestion is possible for onsite workers and trespassers.	Current
	Dermal Contact with chemicals in surface soils*	Yes	Yes	No. Surface soils on the Site are contaminated and dermal contact is possible for onsite workers and trespassers. However, toxicological information is insufficient for quantitatively evaluating dermal exposure to PAHs.	NA*
Subsurface Soils	Incidental ingestion of chemicals in subsurface soils	Yes	Yes	Workers may come into contact with contaminated subsurface soil during excavation. A screening analysis showed, however, that risks from this pathway would be minimal.	NA
Surface Water	Incidental ingestion of surface water from swimming or fishing activities	No	No	No. Concentrations of chemicals in surface water are very low and no COCs were identified.	NA
	Dermal contract with surface during swimming or fishing activities	No	No	No. Concentrations of chemicals in surface water are very low and no COCs for surface water were identified.	NA
Resuspended	Inhalation of airborne dust resuspended from	Yes	Yes	No. Screening analyses were performed for worker	NA

* At the time the BRA was conducted, there were no dermal slope factors to quantitatively evaluate risk from dermal contact with contaminated surface soils. Since that time, EPA has developed slope factors and it would be appropriate to evaluate the pathway quantitatively if the risk assessment were conducted today.

TABLE 27

Potential Pathways Of Exposure In The Vicinity Of The Livingston Rail Yard, Montana

Medium of Concern	Potential Exposure Pathway	Pathway Likely to be Currently Complete?	Pathway Potentially Complete in the Future?	Exposure to be Quantitatively Evaluated	Pathway Evaluated Quantitatively for Current or Future Exposures?
Dust and Soil Vapors	contaminated surface soils and of vapors emanating from soil			exposures to soil gas and residential exposures to resuspended dust. The analyses showed that significant chemical exposures are not expected from these pathways.	
Indoor Air	Inhalation of chemicals volatilizing from groundwater or subsurface soils and entering basements of homes	Yes	Yes	Yes. Basement air is contaminated and inhalation of chemicals in indoor air is likely for residents and workers.	Current
	Inhalation of volatile organic chemicals when showering	No	Yes	Yes. Inhalation of volatile chemicals is possible during showering and bathing if water from the contaminated plume is used.	Future
Breast Milk	Ingestion of breast milk by infants of mothers exposed to site-related contaminants	No	Yes	No. Chemicals in groundwater are not likely to bioaccumulate, and residential soils are not greatly contaminated. Bioaccumulation of COCs in breast milk is not expected.	NA
Fish	Ingestion of fish caught by fishermen from the Yellowstone River	No	No	Contaminant levels in surface water and fish are very low, and no contaminants (VOCs or SVOCs) have been detected in fish tissues.	NA
Home-grown Vegetables	Ingestion of home-grown vegetables grown in contaminated soil and/or watered with contaminated groundwater	No	No	No. Contaminated levels in soils offsite are low, and chemicals in groundwater are not lipophilic.	NA
Beef and Dairy Products	Ingestion of beet and dairy products from cows raised near the Site and exposed to site-related contaminants in soil, groundwater, or surface water	No	No	No. Chemicals in groundwater are not lipophilic, and soils off site are not contaminated or have only low levels of contaminants. Furthermore, no cattle are raised near the Site.	NA
Sediment	Ingestion of Sediment	No	Yes	Yes. Ingestion of sediment is possible during recreational activities at the Yellowstone River.	Future
	Dermal Contact with Sediment	No	Yes	Yes. Dermal contact is possible during recreational activities at the Yellowstone River.	Future

* At the time the BRA was conducted, there were no dermal slope factors to quantitatively evaluate risk from dermal contact with contaminated surface soils. Since that time, EPA has developed slope factors and it would be appropriate to evaluate the pathway quantitatively if the risk assessment were conducted today.

TABLE 28

Matrix Of Exposure Routes To Be Evaluated

Exposure Medium/ Exposure Route	Residential Population	Commercial/ Industrial Population	Recreational Population
Soil			
Ingestion	Child (6-15)	Worker	
Groundwater			
Ingestion	Adult Child (1-6) Child (6-15)		
Dermal Contact	Adult Child (1-6) Child (6-15)		
Sediment			
Ingestion			Recreational Adult Recreational Child
Dermal Contact			Recreational Adult Recreational Child
Air			
Inhalation of Volatiles (indoors)	Adult Child (1-6) Child (6-15)		

TABLE 29
SUMMARY OF TOTAL CANCER RISKS FOR RESIDENTS AND NONCANCER HEALTH EFFECTS FOR FUTURE RESIDENTS.

TOTAL CANCER RISKS FOR RESIDENTS		
Pathway	**Carcinogenic Risk**	
	Current	**Future**
Groundwater ingestion	NA	1.2×10^{-4}
Dermal contact with groundwater and inhalation of volatiles in groundwater	NA	1.2×10^{-4}
Inhalation of indoor air	1.6×10^{-6} [a] – 1.8×10^{-5} [b]	1.6×10^{-6} [a] – 1.8×10^{-5} [b]
Soil ingestion (6-15 year old child only)	7.2×10^{-7}	7.2×10^{-7}
Total (with inhalation of basement air)	1.9×10^{-5}	2.6×10^{-4}
Total (without inhalation of basement air)	7.2×10^{-7}	2.3×10^{-4}

NONCANCER HEALTH EFFECTS FOR FUTURE RESIDENTS			
Pathway	**Hazard Indices**		
	1-6 Year Old Child	**6 – 15 Year Old Child**	**Adult**
Groundwater ingestion	2.8×10^{0}	1.2×10^{0}	1.1×10^{0}
Dermal contact with groundwater and inhalation of groundwater COCs	2.8×10^{0}	1.2×10^{0}	1.1×10^{0}
Inhalation of indoor air	4.6×10^{0} – 7.5×10^{0} [b]	2.0×10^{0} a – 3.2×10^{0} [b]	1.1×10^{0} [a] – 1.7×10^{0} [b]
Total (with inhalation of basement air)	13.1×10^{0}	5.6×10^{0}	3.9×10^{0}
Total (without inhalation of basement air)	5.56	2.4	2.1

a. Low use scenario
b. High use scenario

TABLE 30
CARCINOGENIC RISKS ASSOCIATED WITH INGESTION OF GROUNDWATER FOR RESIDENTS.

Chemical	Chronic Daily Intake (mg/kg-day)	Oral Slope Factor $(mg/kg\text{-}day)^{-1}$	Incremental Lifetime Cancer Risk
Tetrachloroethylene	2.01E-03	5.20E-02	1.04E-04
Trichloroethylene	1.63E-04	1.10E-02	1.79E-06
Vinyl Chloride	4.50E-06	1.90E+00	8.56E-06
1,4 Dichlorobenzene	3.83E-05	2.40E-02	9.19E-07
		Total Cancer Risk	1.16E-04

TABLE 31
CARCINOGENIC RISKS ASSOCIATED WITH INGESTION OF SOIL.

Chemical	Chronic Daily Intake (mg/kg-day)	Oral Slope Factor $(mg/kg\text{-}day)^{-1}$	Incremental Lifetime Cancer Risk
6 – 15 YEAR OLD CHILD (TRESPASSER)			
Benzo(a)pyrene	2.26E-08	7.30E+00	1.65E-07
Benzo(b)fluoranthene	5.87E-08	7.30E+00	4.29E-07
Benzo(k)fluoranthene	5.14E-09	7.30E-02	3.75E-10
Chrysene	2.82E-08	7.30E-02	2.06E-09
Dibenz(a,h)anthracene	1.64E-08	7.30E+00	1.20E-07
Indeno(1,2,3cd)pyrene	2.10E-08	7.30E-02	1.53E-09
	Total Cancer Risk		7.18E-07
WORKER			
Benzo(a)pyrene	1.03E-06	7.30E+00	7.52E-06
Benzo(b)fluoranthene	1.24E-06	7.30E+00	9.09E-06
Benzo(k)fluoranthene	9.39E-07	7.30E-02	6.85E-08
Chrysene	1.22E-06	7.30E-02	8.91E-08
Dibenz(a,h)anthracene	2.08E-07	7.30E+00	1.52E-06
Indeno(1,2,3cd)pyrene	3.90E-07	7.30E-02	2.85E-08
	Total Cancer Risk		1.83E-05

TABLE 32
CARCINOGENIC RISKS ASSOCIATED WITH INHALATION OF INDOOR AIR.

Chemical	Residence	Carcinogenic Risk (Low Use Scenario)	Carcinogenic Risk (High Use Scenario)
PCE	NE-1	4.84×10^{-6}	8.64×10^{-6}
	SE-5	2.14×10^{-6}	4.63×10^{-6}
	NE-4	1.06×10^{-6}	1.92×10^{-6}
	NE-2	1.03×10^{-6}	1.88×10^{-6}
	NE-3	2.11×10^{-6}	1.76×10^{-6}
	SE-2	8.76×10^{-7}	9.53×10^{-7}
TCE	NE-1	3.13×10^{-7}	4.98×10^{-7}
	SE-5	4.55×10^{-7}	6.64×10^{-7}
	NE-4	4.32×10^{-7}	3.37×10^{-7}
	NE-2	1.19×10^{-7}	1.47×10^{-7}
	NE-3	1.26×10^{-6}	1.54×10^{-6}
	SE-2	1.42×10^{-7}	1.42×10^{-7}
Vinyl Chloride	NE-1	4.74×10^{-7}	4.74×10^{-7}
	SE-5	4.74×10^{-7}	4.74×10^{-7}
	NE-4	4.74×10^{-7}	4.74×10^{-7}
	NE-2	4.74×10^{-7}	4.74×10^{-7}
	NE-3	4.74×10^{-7}	4.74×10^{-7}
	SE-2	1.71×10^{-5}	1.71×10^{-5}
Total Risk	NE-1	5.63×10^{-6}	9.61×10^{-6}
	SE-5	3.07×10^{-6}	5.77×10^{-6}
	NE-4	1.96×10^{-6}	2.73×10^{-6}
	NE-2	1.62×10^{-6}	2.50×10^{-6}
	NE-3	4.13×10^{-6}	3.49×10^{-6}
	SE-2	1.81×10^{-5}	1.82×10^{-5}

PCE = Tetrachloroethene
TCE = Trichloroethene

TABLE 33
NONCARCINOGENIC HAZARD INDICES ASSOCIATED WITH INGESTION OF GROUNDWATER.

Chemical	Chronic Daily Intake (mg/kg-day)	RfD (mg/kg-day)$^{-1}$	Hazard Quotient
1 – 6 YEAR OLD CHILD			
Chlorobenzene	2.11E-03	2.00E-02	1.06E-01
Tetrachloroethylene	1.22E-02	1.00E-02	1.22E+00
Trichloroethylene	9.90E-04	6.00E-03	1.65E-01
Cis-1,2 Dichloroethylene	1.25E-02	1.00E-02	1.25E+00
2-Chlorotoluene	7.83E-04	2.00E-02	3.92E-02
	Total Hazard Index		2.78E+00
6 – 15 YEAR OLD CHILD			
Chlorobenzene	9.14E-04	2.00E-02	4.57E-02
Tetrachloroethylene	5.27E-03	1.00E-02	5.27E-01
Trichloroethylene	4.28E-04	6.00E-03	7.13E-02
Cis-1,2 Dichloroethylene	5.39E-03	1.00E-02	5.39E-01
2-Chlorotoluene	3.39E-04	2.00E-02	1.69E-02
	Total Hazard Index		1.20E+00
ADULT			
Chlorobenzene	8.05E-04	2.00E-02	4.03E-02
Tetrachloroethylene	4.64E-03	1.00E-02	4.64E-01
Trichloroethylene	3.77E-04	6.00E-03	6.28E-02
Cis-1,2 Dichloroethylene	4.75E-03	1.00E-02	4.75E-01
2-Chlorotoluene	2.98E-04	2.00E-02	1.49E-02
	Total Hazard Index		1.06E+00

TABLE 34
NONCARCINOGENIC HAZARD INDICES ASSOCIATED WITH INHALATION OF BASEMENT AIR.

Chemical	Receptor	Residence	Hazard Quotient (Low Use Scenario)	Hazard Quotient (High Risk Scenario)
PCE	Adults	NE-1	0.42	0.75
		SE-5	0.19	0.40
		NE-4	0.09	0.17
		NE-2	0.09	0.16
		NE-3	0.18	0.15
		SE-2	0.08	0.08
	1 – 6 Year Old Children	NE-1	1.836	3.28
		SE-5	0.812	1.766
		NE-4	0.402	0.729
		NE-2	0.390	0.713
		NE-3	0.802	0.667
		SE-2	0.332	0.361
	6 – 15 Year Old Children	NE-1	0.79	1.42
		SE-5	0.35	0.76
		NE-4	0.17	0.31
		NE-2	0.17	0.31
		NE-3	0.35	0.29
		SE-2	0.14	0.16

PCE = Tetrachloroethene

TABLE 35

Comparison Of Alternatives Using Eight Criteria

	Overall Protection of Health and Environment	Compliance with ERCLs	Long-Term Effectiveness and Permanence	Reduction in Toxicity, Mobility, and Volume	Short-Term Effectiveness	Implementability	Cost	Community Acceptance
SOIL AND GROUNDWATER								
1. No action	poor	no	none	none	good	good	medium	poor
2. Institutional controls, SVE and alternate water supply, asbestos abatement	fair	no	poor	poor	good	good	medium	poor
3. SVE, air sparging, institutional controls, asbestos abatement	good	yes	good	fair	fair	good	medium	poor
4. SVE, air sparging, excavation, ex-situ soil treatment, institutional controls, asbestos abatement	good	yes	good	good	fair	good	high	fair
5. Groundwater pumping, ex-situ treatment, SVE, institutional controls, asbestos abatement	good	no	fair	fair	fair	good	high	good
6. (DEQ's preferred remedy) SVE, excavation, ex-situ soil treatment, institutional controls, asbestos abatement	good	yes	good	good	fair	good	high	good
DIESEL FUEL								
A. No action	poor	no	none	none	good	good	none	poor
B. Intrinsic bioremediation, institutional controls	fair	no	none	none	good	good	low	poor
C. Passive recovery	good	yes	good	good	poor	good	high	fair
D. Enhanced two-pump recovery	good	yes	good	good	poor	good	medium	poor
E. Passive recovery of diesel fuel containing VOCs	poor	no	poor	fair	fair	good	low	poor
F. Passive recovery and soil venting	poor	no	fair	fair	poor	good	medium	good
Modified F, (DEQ's preferred remedy) Expanded passive recovery, monitoring and soil venting	good	yes	good	good	poor	good	high	good

TABLE 36

Cost For Soil And Groundwater Remedial Alternatives

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6 DEQ Preferred Remedy
Description of Alternatives	**No Action**	**Institutional Controls, SVE, Alternative Water Supplies and Asbestos Abatement**	**SVE, In Situ Air Sparging, Institutional Controls and Asbestos Abatement**	**SVE, Air Sparging, Excavation and Ex situ Soil Treatment, Institutional Controls and Asbestos Abatement**	**GW Pumping and Ex situ Treatment, SVE, Institutional Controls and Asbestos Abatement**	**SVE, Excavation, Soil Treatment, Institutional Controls, Groundwater Monitor-ing and Asbestos Abatement**
Capital Cost	$ 0	$ 7,100	$ 79,267	$ 513,410	$ 147,789	$ 383,245[1]
Annual Remedial System Operation and Maintenance (O&M) Cost	$ 0	$ 17,600	$ 75,000	$ 66,000	$ 123,000	$ 17,600
Years to Complete Remedy	0	5	5	5	5	10
Annual Groundwater Monitoring Cost	$ 33,700	$ 33,700	$ 33,700	$ 33,700	$ 33,700	$ 33,700
Number of Years Monitoring Required	20	20	10	10	10	20
Institutional Controls Cost		$ 66,000	$ 66,000	$ 66,000	$ 66,000	$ 66,000
Annual Cinder Pile Cap O&M Cost						$ 12,500
Years for Cinder Pile Cap O&M						100
Total Present Worth[2]	$501,000	$665,000	$776,000	$1,170,000	$1,065,000	$1,495,734

[1] Includes one time basement vapor and private well sampling.

[2] Total present worth for all alternatives includes a 3 percent discount rate.

TABLE 37

Cost For Diesel Fuel Recovery Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F	Modified F
Description of Alternatives	**No Action**	**Intrinsic Bioremediation and Institutional Controls**	**Passive Recovery**	**Enhanced Two-Pump Recovery**	**Passive Recovery of Diesel Fuel Containing VOCs**	**Soil Venting and Passive Recovery**	**(DEQ Preferred Remedy) Expanded Passive Recovery, Monitoring and Soil Venting**
Capital Cost	$ 0	$ 50,000	$ 417,933	$ 260,032	$ 66,970	$ 142,080	$ 481,682
Annual Remedial Operation and Maintenance (O&M) Cost	$ 0	$ 5,000	$83,390	$ 138,145	$ 62,944	$ 76,744	$ 75,880[1]
Years to Complete[2]	0	20	6	3	3	5	6
Annual Monitoring Cost							$ 9,900[3]
Years for Diesel Fuel Monitoring							10
Total Present Worth[4]	$ 0	$ 124,387	$ 869,673	$ 650,791	$ 245,014	$ 493,545	$ 1,010,694[5]

[1] O&M costs for Modified Alternative F includes at least 6 years for free product recovery and approximately 10 years for soil venting.

[2] The number of years to complete Alternatives A - F were provided by BNSF. BNSF cost estimates to complete Alternatives A - F are based on different interpretations than DEQ on the volume of diesel fuel remaining and the volume of diesel fuel that needs to be removed. DEQ believes the number of years to complete the remedy and resulting cost may be underestimated. For comparison purposes DEQ used 6 years to estimate the cost of DEQ's preferred remedy. Actual years to complete the remedy will be based on the documented performance of the diesel fuel recovery system to be implemented during Phase I.

[3] Annual monitoring cost for Modified Alternative F includes sampling, analyses and reporting in addition to the annual groundwater monitoring cost listed in Table 3.

[4] Total present worth for all alternatives includes a 3 percent discount rate.

[5] Includes 3 years of natural attenuation monitoring.

Table 38

Selected Remedy Cost Estimate Summary

Description	QTY	UNIT	Unit Cost	Total	Notes
Sludge					Unknown volume of sludge may be present at C&P
Excavation					
Off-site disposal				Unknown	
VOC Soils					Based on FS, minus LRC costs
Design Engineer	240	$/hr	75	18,000	
Draftsman	60	$/hr	45	2,700	
Printing	1	ls	500	500	
Labor Engineer	40	$/hr	75	3,000	
Demo Subcontractor	1	ls	8000	8,000	
Move Parts Cleaner	1	ls	19680	19,680	
Materials	1	ls	4259	4,259	
Labor Engineer	80	$/hr	75	6,000	
Technician/equipment op.	80	$/hr	40	3,200	
Laborer	80	$/hr	24	1,920	
Concrete cutter	200	$/ft	3.5	700	
Mobilization	100	$/mile	2.5	250	
Excavator	80	$/hr	75	6,000	
Dump Truck	80	$/hr	40	3,200	
Pickup Truck	80	$/hr	5	400	
Vac Trailer	40	$/hr	10	400	
Compactor	3	$/day	100	300	
Backfill (clean)	300	$/yd^3	4.5	1,350	Used ½ FS cost since Cinder Pile will not require excavation of soil
Transfer Pit Engineer	8	$/hr	75	600	
Technical/equipment op.	12	$/hr	40	480	
Laborer	12	$/hr	24	288	
Excavator	12	$/hr	75	900	
Dump truck	12	$/hr	45	540	
Pickup truck	12	$/hr	5	60	
Remove & Spread Treated Soil					FS cost minus shipping and disposal fee, since treated soil does not require incineration
Engineer	24	$/hr	75	1,800	
Technician	40	$/hr	40	1,600	
Laborer	40	$/hr	24	960	
Loader	40	$/hr	30	1,200	
Well Installation Engineer	30	$/hr	75	2,250	FS cost, but well installation cost cut in ½ and well completion and development cost omitted because air sparging not used
Technician	20	$/hr	40	800	
Pickup Truck	30	$/hr	5	150	
Driller	40	$/hr	175	7,000	
Electrician	20	$/hr	40	800	
SVE Construction Eng	24	$/hr	75	1,800	
Technician	60	$/hr	40	2,400	
Laborer	60	$/hr	24	1,440	
Electrical supplies	6	ls	2000	12,000	
Pickup truck	60	$/hr	5	300	
SVE Wells 4” well points	5	$/each	9.5	48	Used FS, but reduced number of well caps, since air sparging not

Table 38 (Continued)

Selected Remedy Cost Estimate Summary

4"X10' screens	5	$/each	57	285	used.
4"X10' casing	5	$/each	31	155	
Bentonite chips (50# bags)	60	$/each	4.75	285	
10/20 sand (100# bags)	50	$/each	8	400	
Concrete (redimix bags)	20	$/bag	8	160	
Flush-Mount Well Covers	5	$/each	52	260	
Misc. Materials					
4" PVC Pipe	200	$/ft	0.94	188	
4" PVC elbows	15	$/each	2.32	35	
Misc. fittings	1	$/each	600	600	
Activated carbon	2000	$/lb	1.5	3,000	
Total Capital Cost				***$122,643***	
Monitoring Engineer	240	$/hr	75	18,000	
Technician	500	$/hr	40	20,000	
Blower (replacement)	0.25	$/each	3,000	750	
PID	0.25	$/each	2,500	625	
Pitot tube	0.25	$/each	300	75	
Truck	500	$/hr	5	2,500	
Misc. parts	1	ls	500	500	
Total Annual O&M Cost				***$42,450***	
Petroleum Contaminated Subsurface Soils Bioventing costs are included in the cost of Free-product Recovery				See free-product recovery costs	These costs are included in the cost of Free-product Recovery
Petroleum Contaminated Surface Soils				Unknown	TPH in surface soils was not analyzed as part of the RI. Unknown area and volume of soil that poses an unacceptable risk may be present in LRY and at C&P
Lead Contaminated Soils				Unknown	Unknown volume of lead contaminated soil may be present at C&P
PAH Contaminated Surface Soils				Unknown	Although the BRA identified that PAH surface soils pose an unacceptable risk, the FS and proposed plan did not address it. Unknown volume of soil requires removal;

Table 38 (Continued)

Selected Remedy Cost Estimate Summary

					possibly limited to hot spot removal.
Asbestos Contaminated Soil & Debris					Costs are based on 24" cap
	200	$/hr	75	15,000	
Engineer	5	$/acre	100	500	
Recontour	11,710	$/yd^3	4.50	52,700	
18" clean fill (hauling, applying)	3904	$/yd^3	2.50	9,800	
6" top soil	3904	$/yd^3	8	31,232	
Provide Soil (load, Hauling, etc.)	1	ls	4,835	4,835	
Revegetation					
Total Capital Cost				***$114,067***	
Annual Mowing	1	ls	2,000	2,000	Cost estimated on mowing 1/month for 6 months; annual inspection
Inspection Engineer	8	$/hr	75	600	
Total O&M Costs				***2600***	
Basement Gas					
Technician	25	$/hr	40	1,000	Assumes sampling of 6 homes, plus ambient air sample and duplicate; additional followup sampling included; also assumes 6 mitigation systems installed
Analyses	8	$/each	350	2,800	
Followup Sampling					
Technician	100	$/hr	40	4,000	
Analyses	32	$/each	350	11,200	
Mitigation Systems	6	ls	5000	30,000	
Total Capital Costs				***$49,000***	
VOC Contaminated Groundwater					
ICs	1	ls	66,000	66,000	IC costs based on FS and assumes one-time lump sum for provision of alternate water
Total Capital Costs				***$66,000***	
Monitoring Cost Included in Monitoring Cost				See Monitoring Cost	Monitoring Cost Included in Monitoring Cost portion of table

Table 38 (Continued)

Selected Remedy Cost Estimate Summary

Free-Product Recovery					
Well Drilling					
Engineer	220	$/hr	75	16,500	
Technician	490	$/hr	40	19,600	
MRL Spotter	440	$/hr	30	13,200	
Subcontractor Driller	1800	$/foot	40	72,000	
Mobilization	1	ls	8500	8,500	
Perdiem	45	$/day	250	11,250	
Pickup Truck	440	$/hr	5	2,200	
6” Casing	120	$/10 ft	93	11,160	
6” Screen	60	$/10 ft	235	14,100	
6” Well Cap	55	$/each	16	880	
Bottom Cap	60	$/each	28	1,680	
Bentonite Plug	600	$/50#bag	4.65	2,790	
Silica Sand	450	$/50#bag	5.50	2,475	Costs not available for hydrophobic filter pac
Hydrophobic Filter Pac	60	$/10 ft			
18” Manholes	45	$/each	112	5,040	
Locks	60	$/each	7	420	
Concrete (2 bags/well)	120	$/60#bag	2.85	342	
Well Develop/Construct Recovery Systems					
Engineer	80	$/hr	75	6,000	
Technician	600	$/hr	40	24,000	
Technician	600	$/hr	40	24,000	
MRL Spotter	400	$/hr	30	12,000	
Pickup Truck	400	$/hr	5	2,000	
Vac Trailer	200	$/hr	10	2,000	
Submersible Pump	5	$/each	400	2,000	
Generator	200	$/hr	3	600	
Product Skimmers	20	$/pump	1500	30,000	
Product Canisters	5	$/each	575	2,875	
Belt Skimmers	10	$/each	3300	33,000	
Compressor	3	$/each	750	2,250	
Venting Blower	2	$/each	2200	4,400	
Sheds	5	$/each	600	3,000	
Product Transport Tank	2	$/each	300	600	
4-Wheeler	1	$/each	5000	5,000	
Air Tight Well Cap	5	$/each	125	625	
Manhole Vaults	15	$/each	350	5,250	
4” PVC Pipe	1000	$/foot	1000	1,220	
Pipe Fittings	1	ls	1	500	
Electrical Supplies	1	ls	1	500	
Total Capital Costs				***$343,957***	
Monitoring & Reporting					
Engineer – Product Rec	120	$/hr	75	9,000	
Technical – Product Rec	400	$/hr	40	16,000	Sampling & Monitoring costs are included in Monitoring; Disposal is estimated on 10,000 gallons of free-product being
Pickup Truck	300	$/hr	5	1,500	
Product/Interface Probe	1	$/unit	1200	1,200	
Misc. Parts	1	$/year	1000	1,000	
Engineer – Bioventing	75	$/hr	75	5,625	
Technician – Bioventing	325	$/hr	40	13,000	
Misc. Parts	1	$/year	1000	1,000	

Table 38 (Continued)

Selected Remedy Cost Estimate Summary

Engineer – Disposal Technician – Disposal Disposal ***Total Annual O&M Costs***	20 100 10000	$/hr $/hr $/gallon	75 40 0.25	1,500 4,000 2,500 ***$56,325***	recovered.
Dissolved Phase Petroleum				$ 0	Monitoring Costs are included in the monitoring component
Lead Contaminated Groundwater				Unknown	Unknown areal impact of lead contaminated groundwater at LRY and may be present at C&P. The RD will require alternatives analysis.

Table 38 (Continued)

Selected Remedy Cost Estimate Summary

Confirmation Sampling				Unknown	Confirmation sampling data for interim remedial actions will be evaluated. If necessary, additional data will be collected to ensure cleanup levels are met. The number of confirmation samples that will be needed is unknown.
Monitoring					
VOCs	20 years	ls	33,700	33,700	FS cost for VOC monitoring cost until cleanup levels are achieved
Dissolved Petroleum & MNA (assume for 10 year period)	1	$/year	9,900	9,900	Dissolved Petroleum and MNA from the proposed plan
Free Product				See O&M costs for Free product recovery	Free Product measurement included in the annual O&M costs for Free product recovery
Private Well Sampling Technician Analyses	40 10	$/hr $/each	40 150	1,600 1,500	Assumes 10 wells/yr for 20 years
Total Annual Monitoring Costs				***$46,700***	

Capital Costs	**Annual O&M Costs (discount factor 7%)**	
	10 years	**20 years**
$122,643	$ 46,700	$36,800
$114,067	$ 56,325	$56,325
$ 49,000	$ 2,600	$ 2,600
$ 66,000	$ 42,450	$42,450
$343,957		

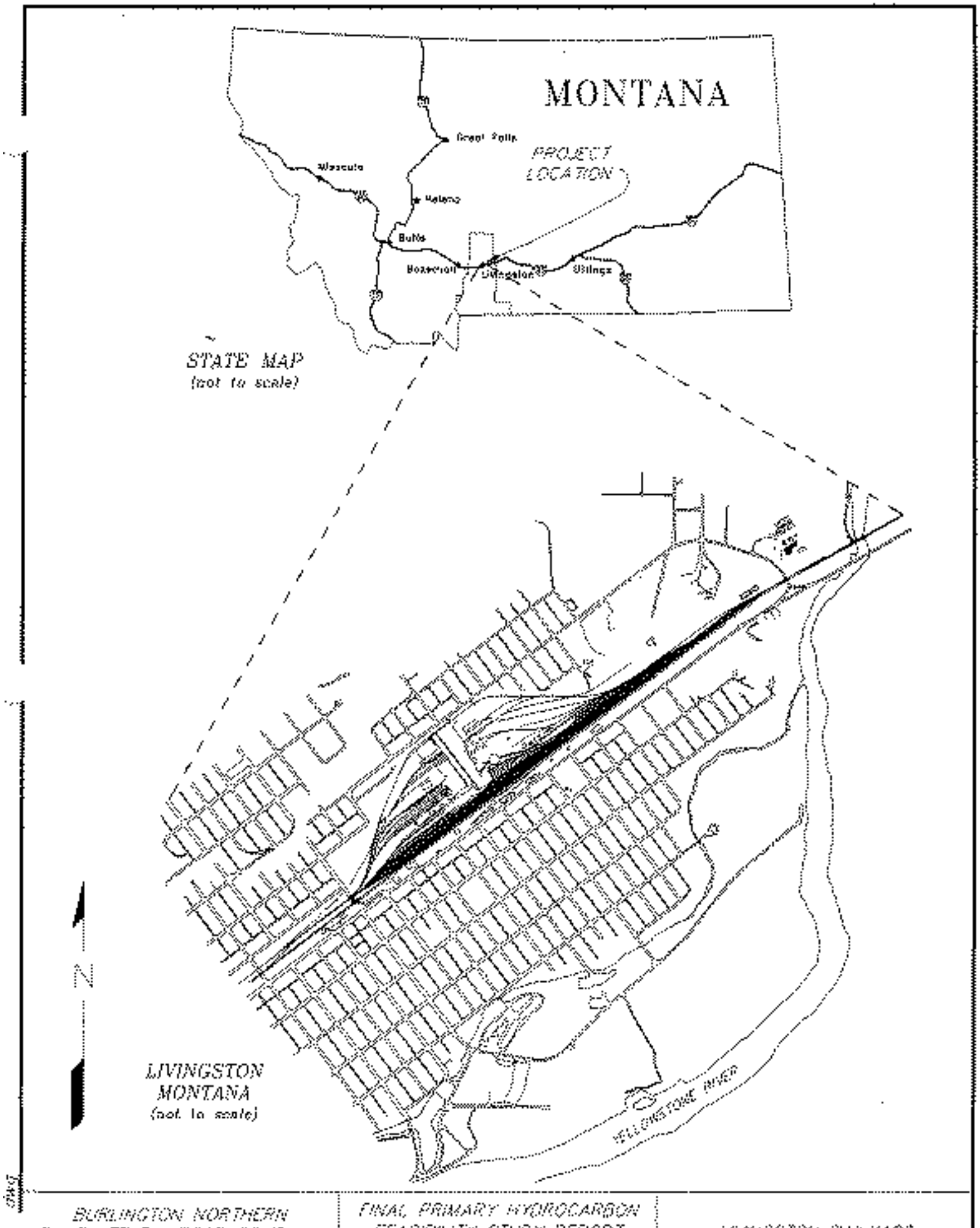
Table 38 (Continued)

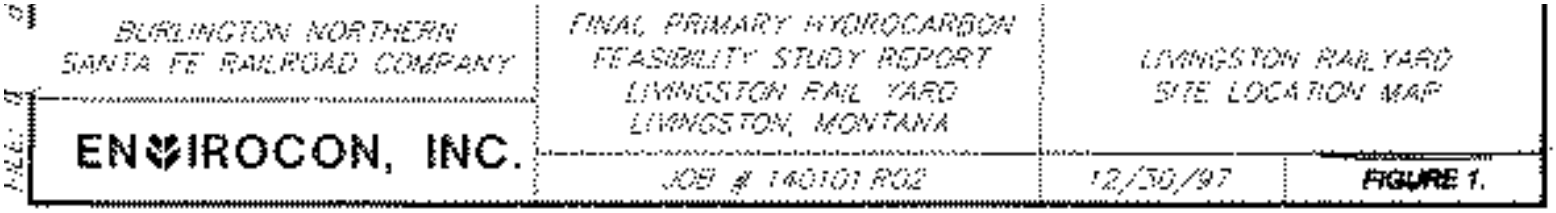
Selected Remedy Cost Estimate Summary

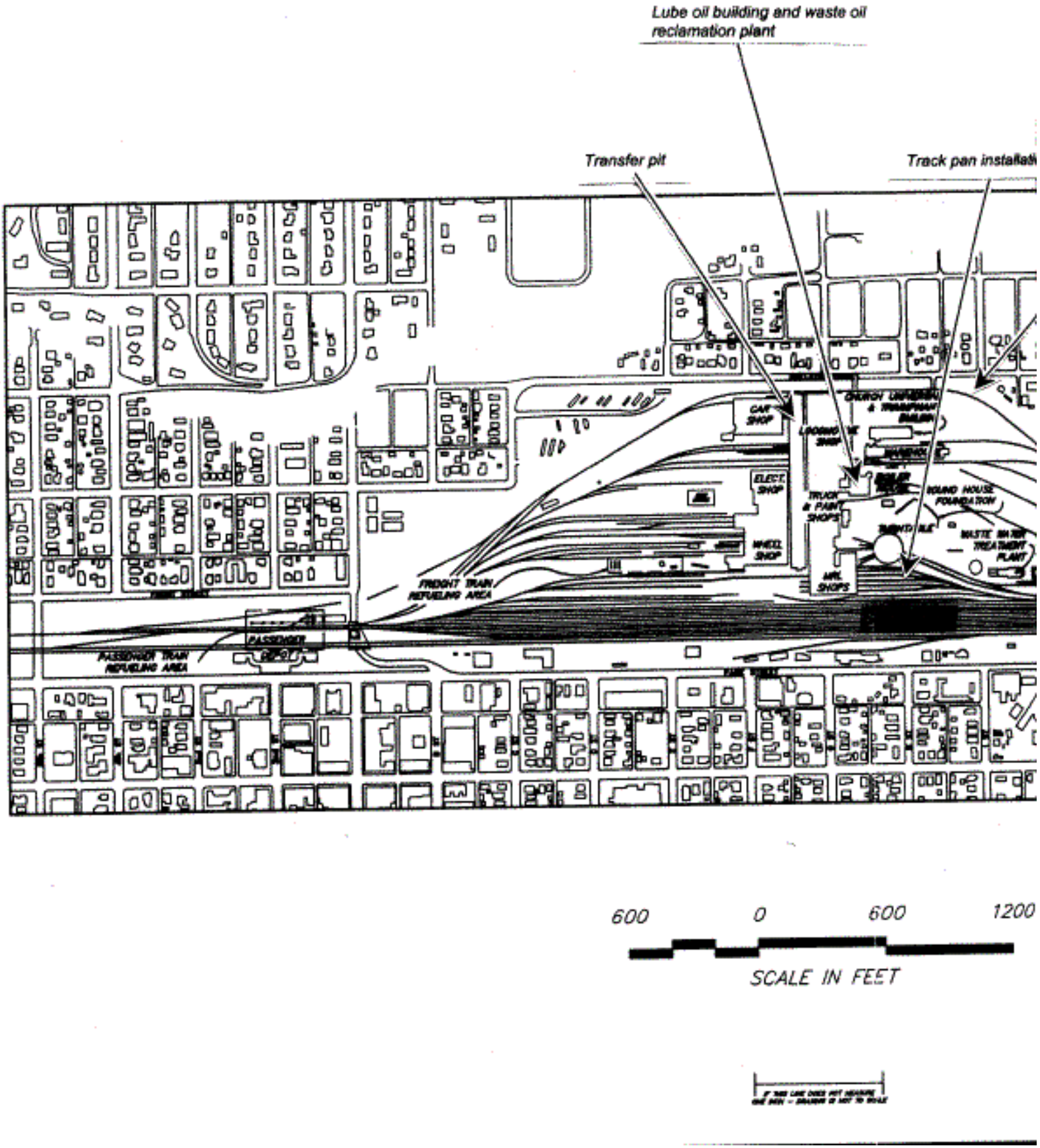
$695,667	**$148,075**	**$138,175**

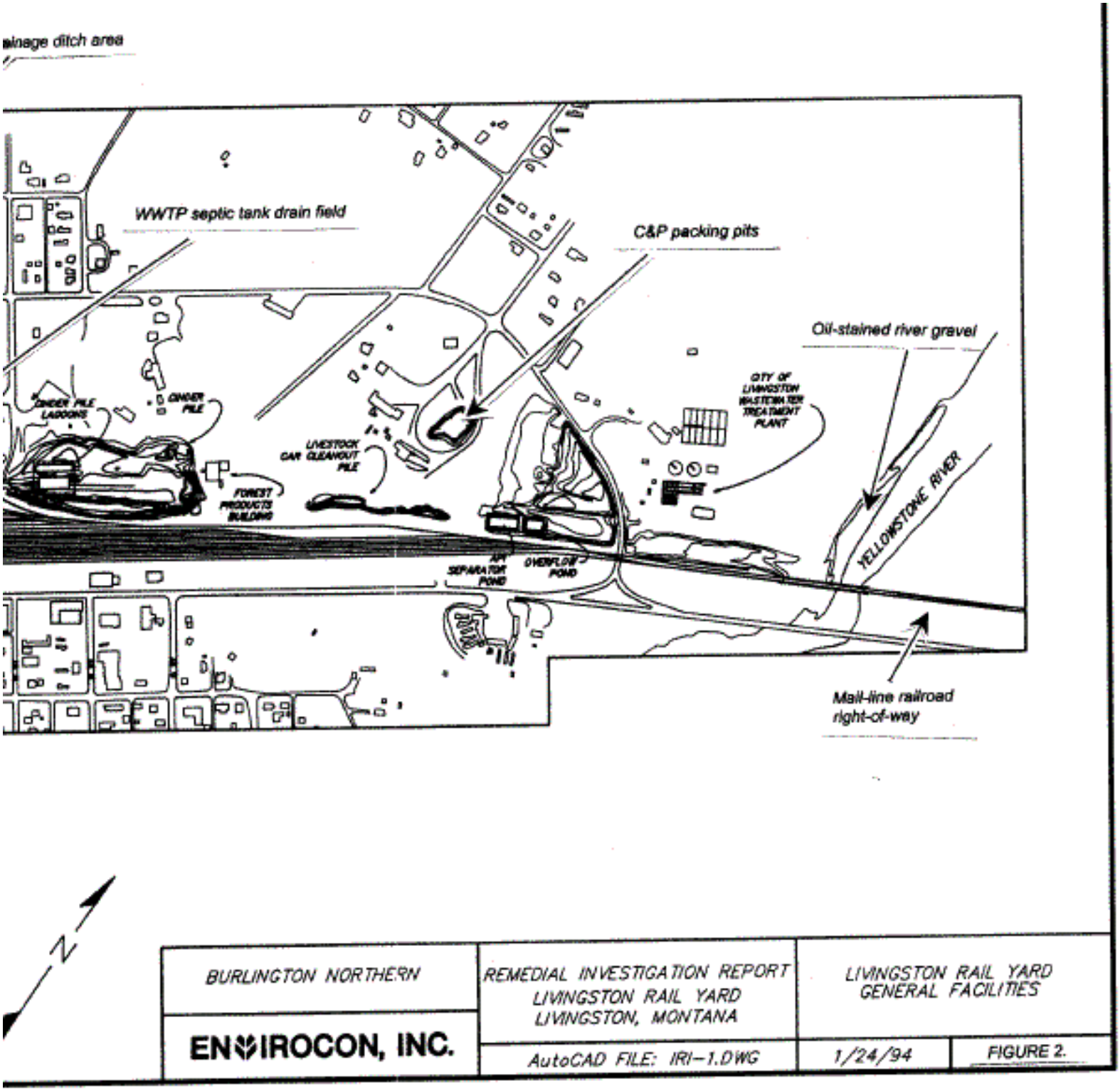
O&M Present Worth =	**1,533,361**
Capital Costs =	**695,667**
Total Present Worth =	**$2,229,028**

LIST OF FIGURES


MONTANA
Great Falls
Missoula
Helena
Butte
Bozeman
Livingston
Billings
PROJECT LOCATION
STATE MAP
(not to scale)
N
LIVINGSTON
MONTANA
(not to scale)
YELLOWSTONE RIVER
BURLINGTON NORTHERN SANTA FE RAILROAD COMPANY
FINAL PRIMARY HYDROCARBON FEASIBILITY STUDY REPORT
LIVINGSTON RAILYARD


BURLINGTON NORTHERN
SANTA FE RAILROAD COMPANY
FINAL PRIMARY HYDROCARBON
FEASIBILITY STUDY REPORT
LIVINGSTON RAIL YARD
LIVINGSTON, MONTANA
LIVINGSTON RAILYARD
SITE LOCATION MAP
ENVIROCON, INC.
JOB # 140101.R02
12/30/97
FIGURE 1.


Lube oil building and waste oil reclamation plant
Transfer pit
Track pan installed
CAR SHOP
ELECT. SHOP
TRUCK & PAINT SHOPS
WHEEL SHOP
MAT. SHOPS
ROUND HOUSE FOUNDATION
WASTE WATER TREATMENT PLANT
FREIGHT TRAIN REFUELING AREA
PASSENGER TRAIN REFUELING AREA
PASSENGER DEPOT
600
0
600
1200
SCALE IN FEET


ainage ditch area
WWTP septic tank drain field
C&P packing pits
Oil-stained river gravel
CITY OF LIVINGSTON WASTEWATER TREATMENT PLANT
YELLOWSTONE RIVER
GINDER PILE LAGOONS
GINDER PILE
LIVESTOCK CAR CLEANOUT PILE
FOREST PRODUCTS BUILDING
API SEPARATOR POND
OVERFLOW POND
Mail-line railroad right-of-way
N
BURLINGTON NORTHERN
ENVIROCON, INC.
REMEDIAL INVESTIGATION REPORT
LIVINGSTON RAIL YARD
LIVINGSTON, MONTANA
LIVINGSTON RAIL YARD
GENERAL FACILITIES
AutoCAD FILE: IRI-1.DWG
1/24/94
FIGURE 2.

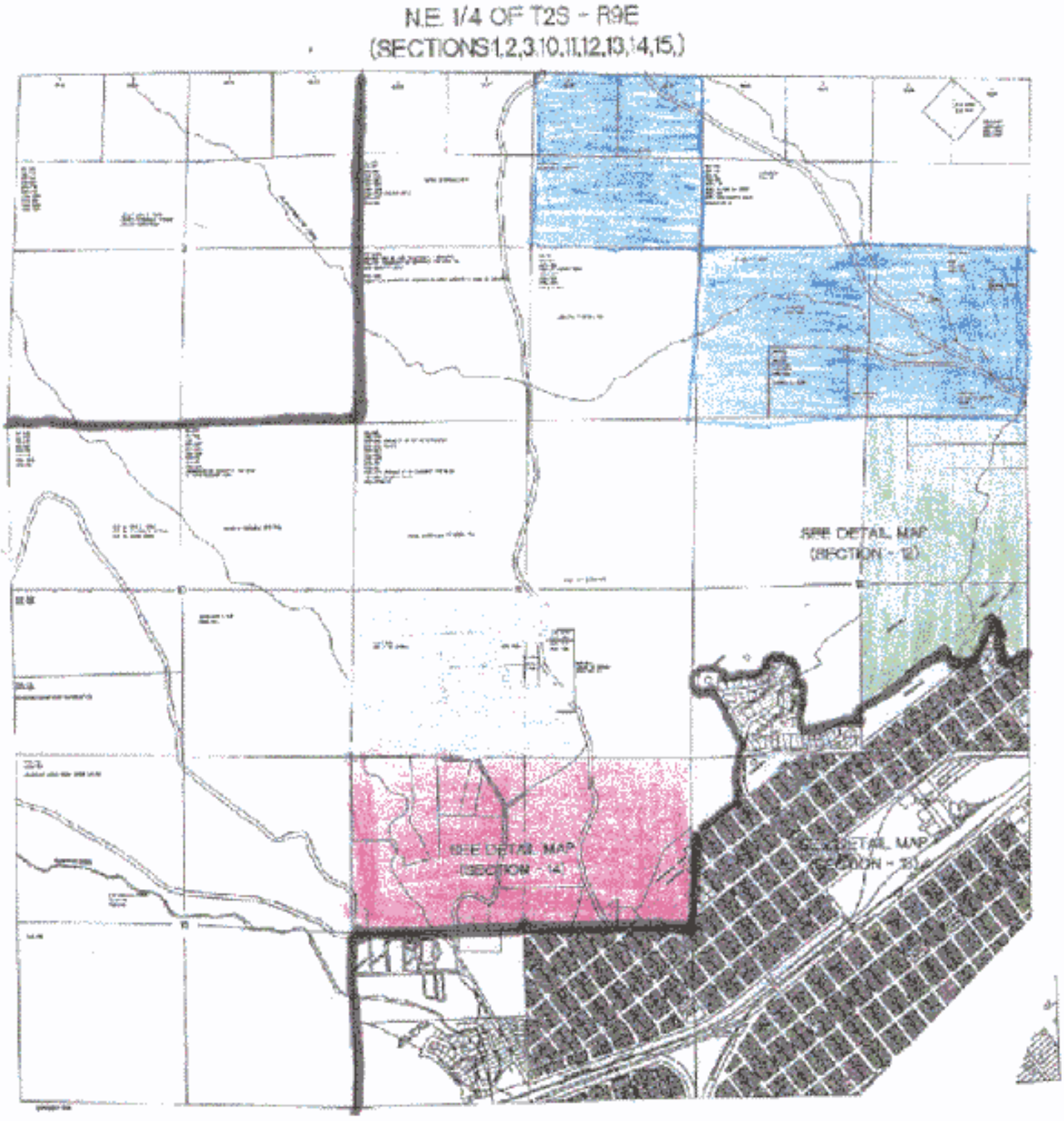


Figure 3. Zoning map.

N.W. 1/4 OF T2S - R10E
(SECTIONS:4,5,6,7,8,9,16,17,18)

Figure 3. Zoning map (cont.)

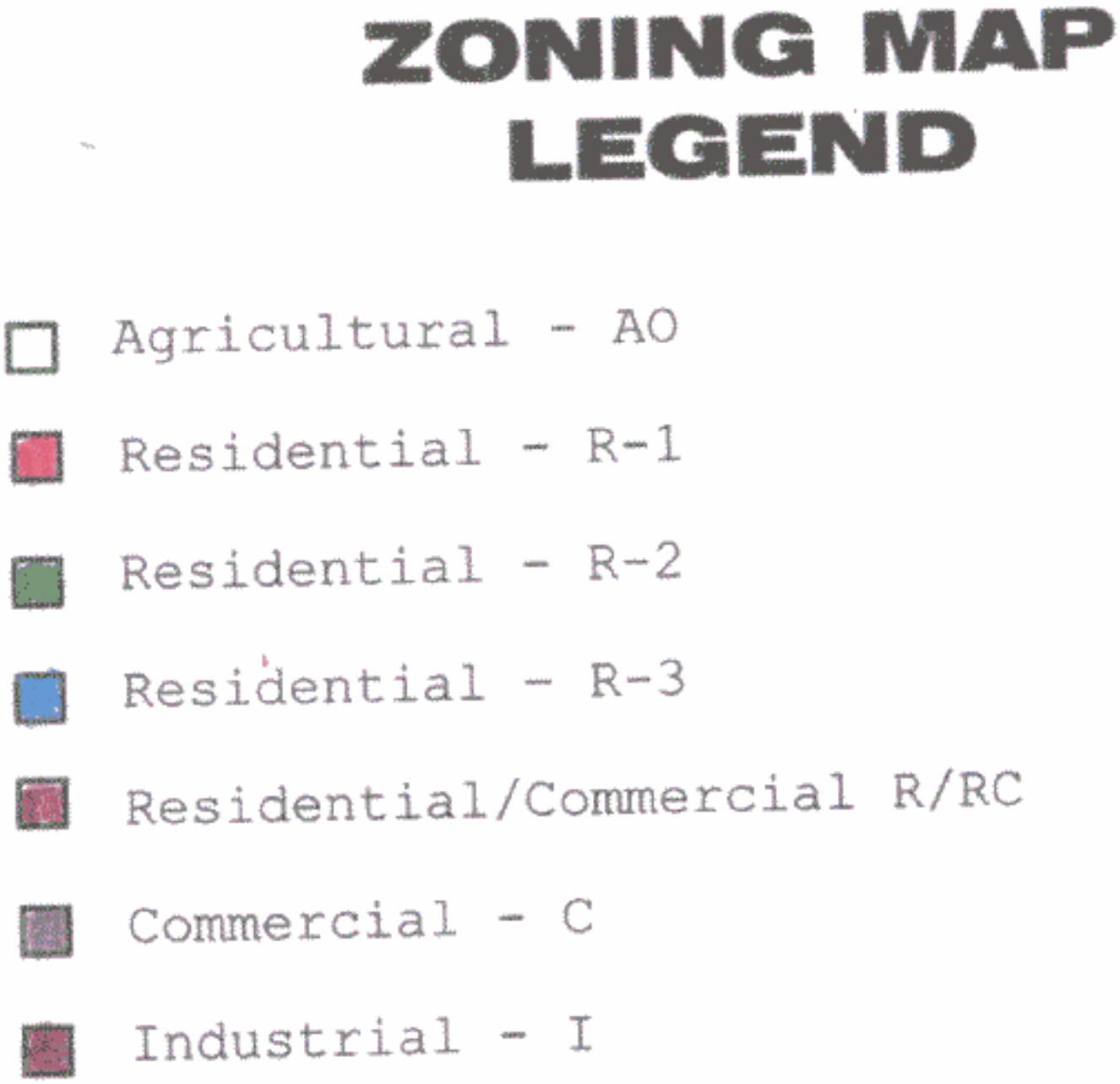


Figure 3. Zoning map (cont.)

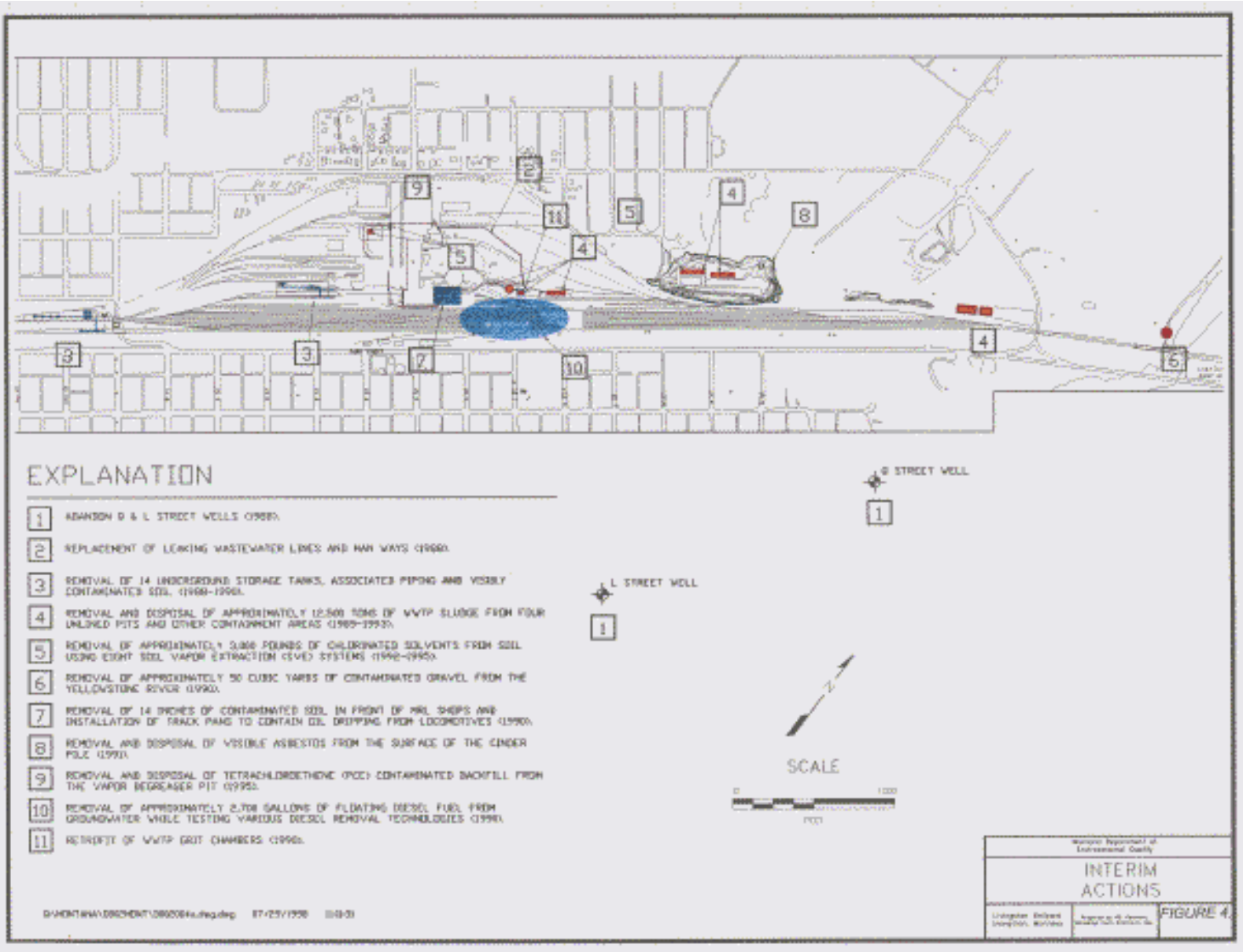
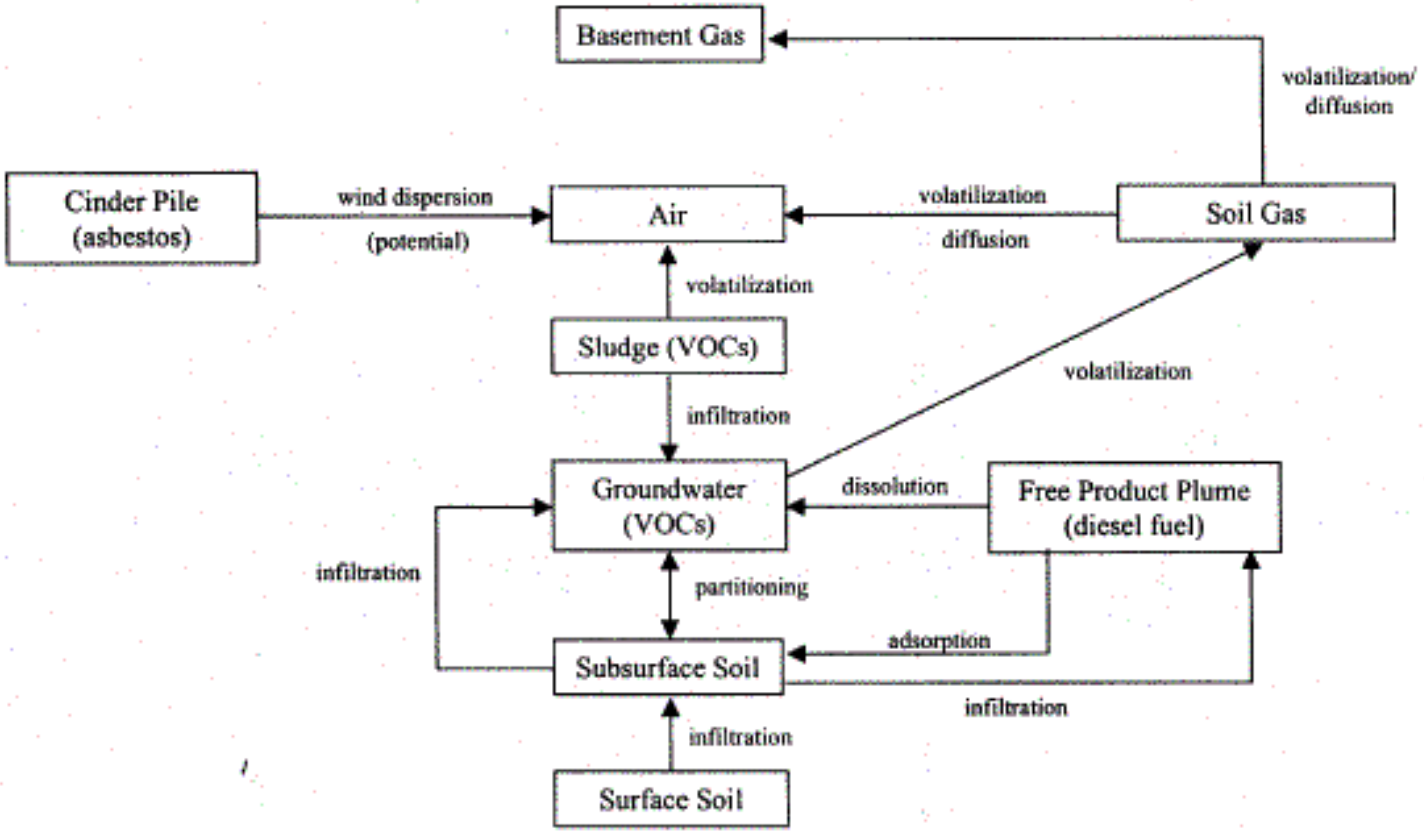
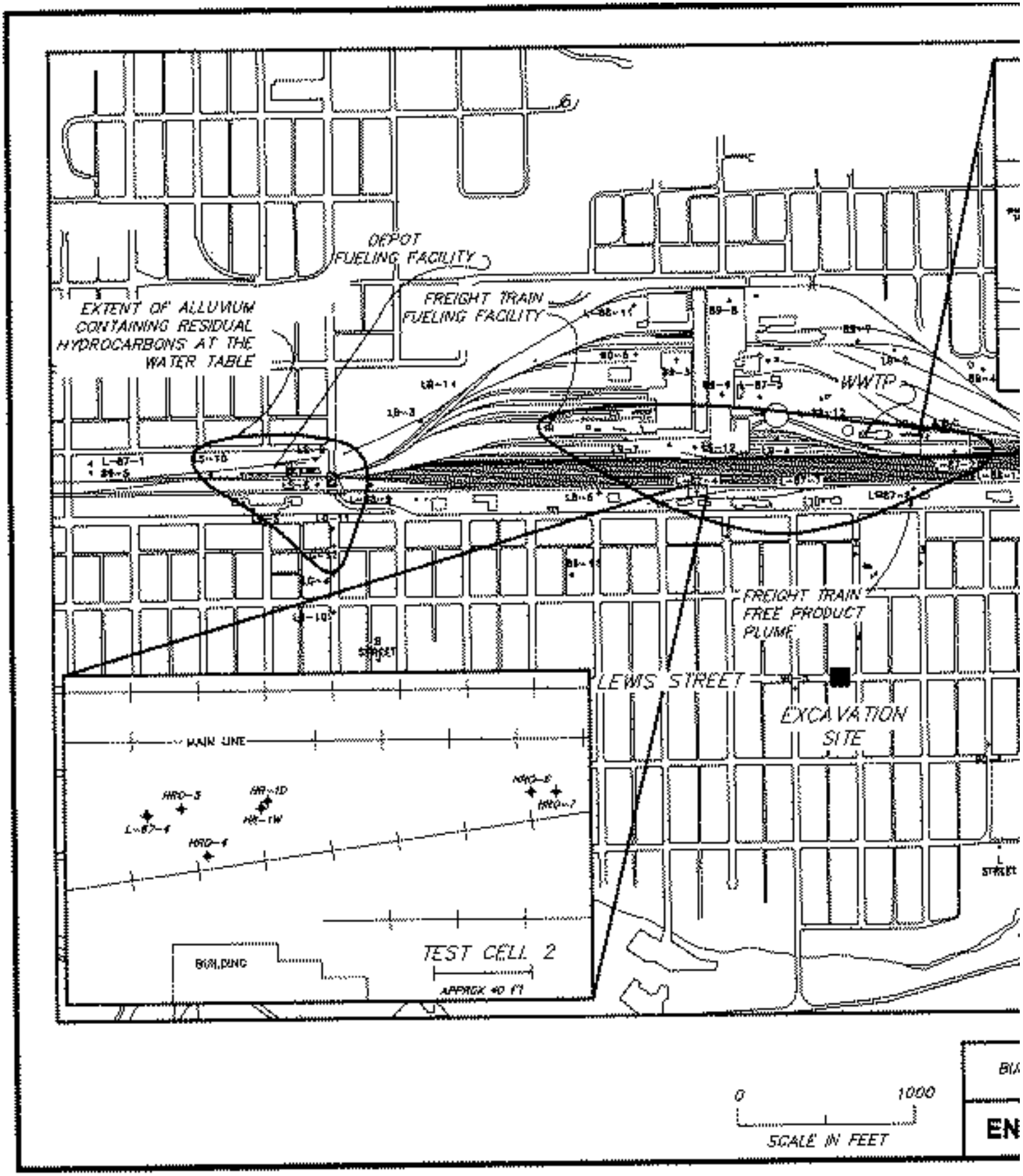
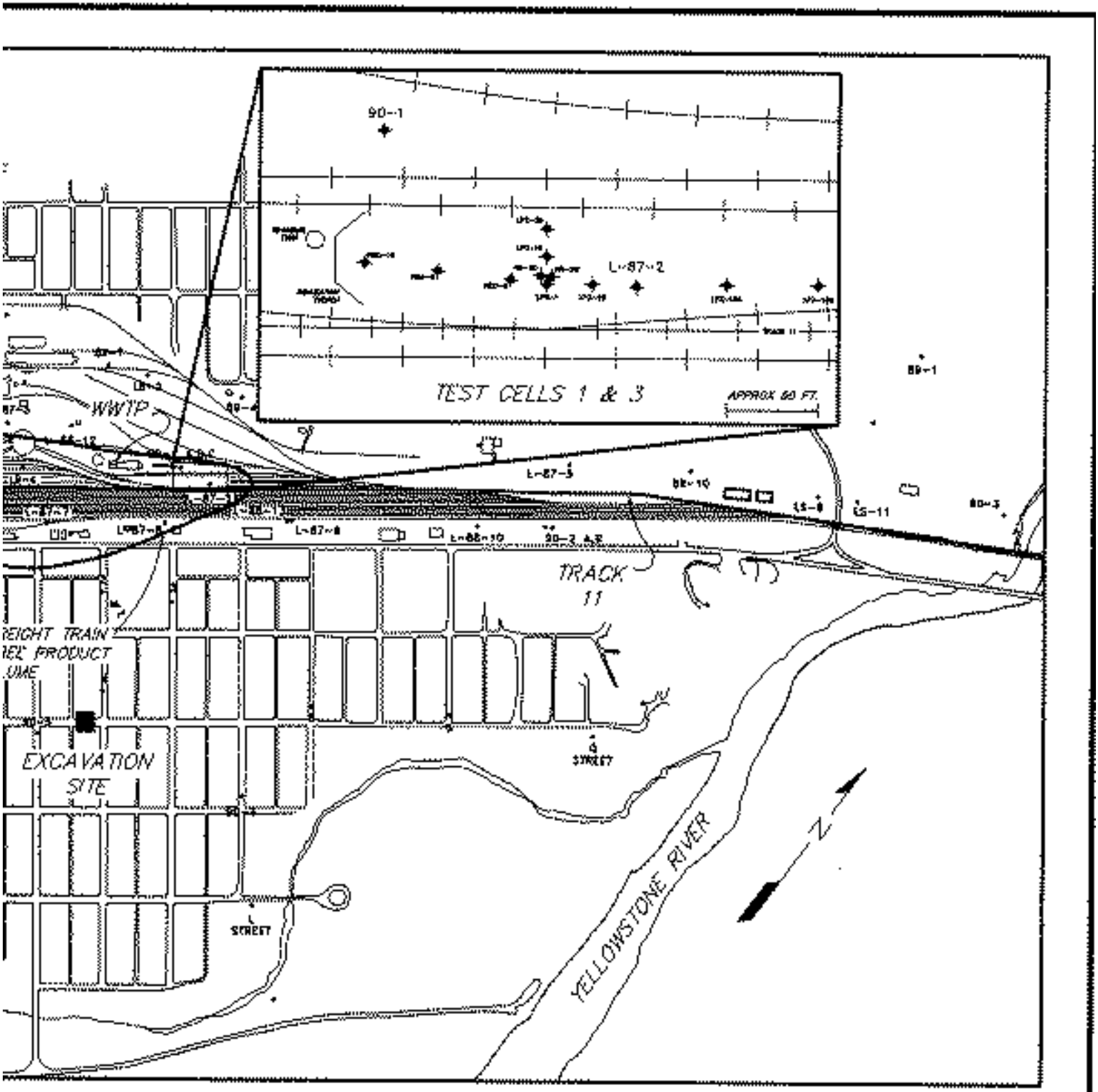
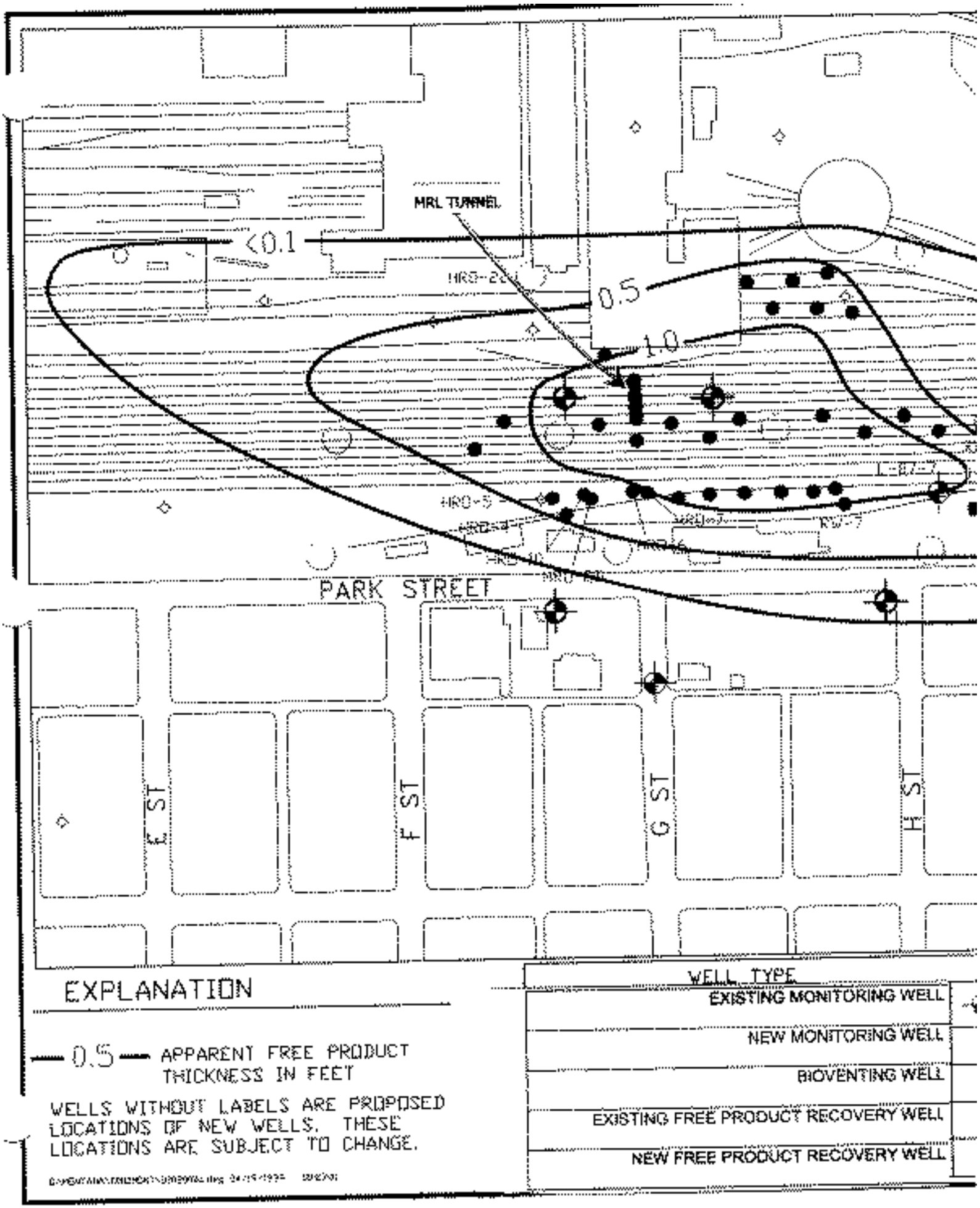

EXPLANATION
1 ABANDON D & L STREET WELLS (1988).
2 REPLACEMENT OF LEAKING WASTEWATER LINES AND MAN WAYS (1988).
3 REMOVAL OF 14 UNDERGROUND STORAGE TANKS, ASSOCIATED PIPING AND VISIBLY CONTAMINATED SOIL (1988-1990).
4 REMOVAL AND DISPOSAL OF APPROXIMATELY 12,500 TONS OF WWTP SLUDGE FROM FOUR UNLINED PITS AND OTHER CONTAINMENT AREAS (1989-1993).
5 REMOVAL OF APPROXIMATELY 9,000 POUNDS OF CHLORINATED SOLVENTS FROM SOIL USING EIGHT SOIL VAPOR EXTRACTION (SVE) SYSTEMS (1990-1995).
6 REMOVAL OF APPROXIMATELY 50 CUBIC YARDS OF CONTAMINATED GRAVEL FROM THE YELLOWSTONE RIVER (1990).
7 REMOVAL OF 14 INCHES OF CONTAMINATED SOIL IN FRONT OF RAIL SHOPS AND INSTALLATION OF TRACK PANS TO CONTAIN OIL DRIPPING FROM LOCOMOTIVES (1990).
8 REMOVAL AND DISPOSAL OF VISIBLE ASBESTOS FROM THE SURFACE OF THE CINDER PILE (1990).
9 REMOVAL AND DISPOSAL OF TETRACHLOROETHENE (PCE) CONTAMINATED BACKFILL FROM THE VAPOR DEGREASER PIT (1995).
10 REMOVAL OF APPROXIMATELY 2,700 GALLONS OF FLOATING DIESEL FUEL FROM GROUNDWATER WHILE TESTING VARIOUS DIESEL REMOVAL TECHNOLOGIES (1990).
11 RETROFIT OF WWTP GRIT CHAMBERS (1996).
D STREET WELL
L STREET WELL
SCALE
INTERIM ACTIONS
FIGURE 4

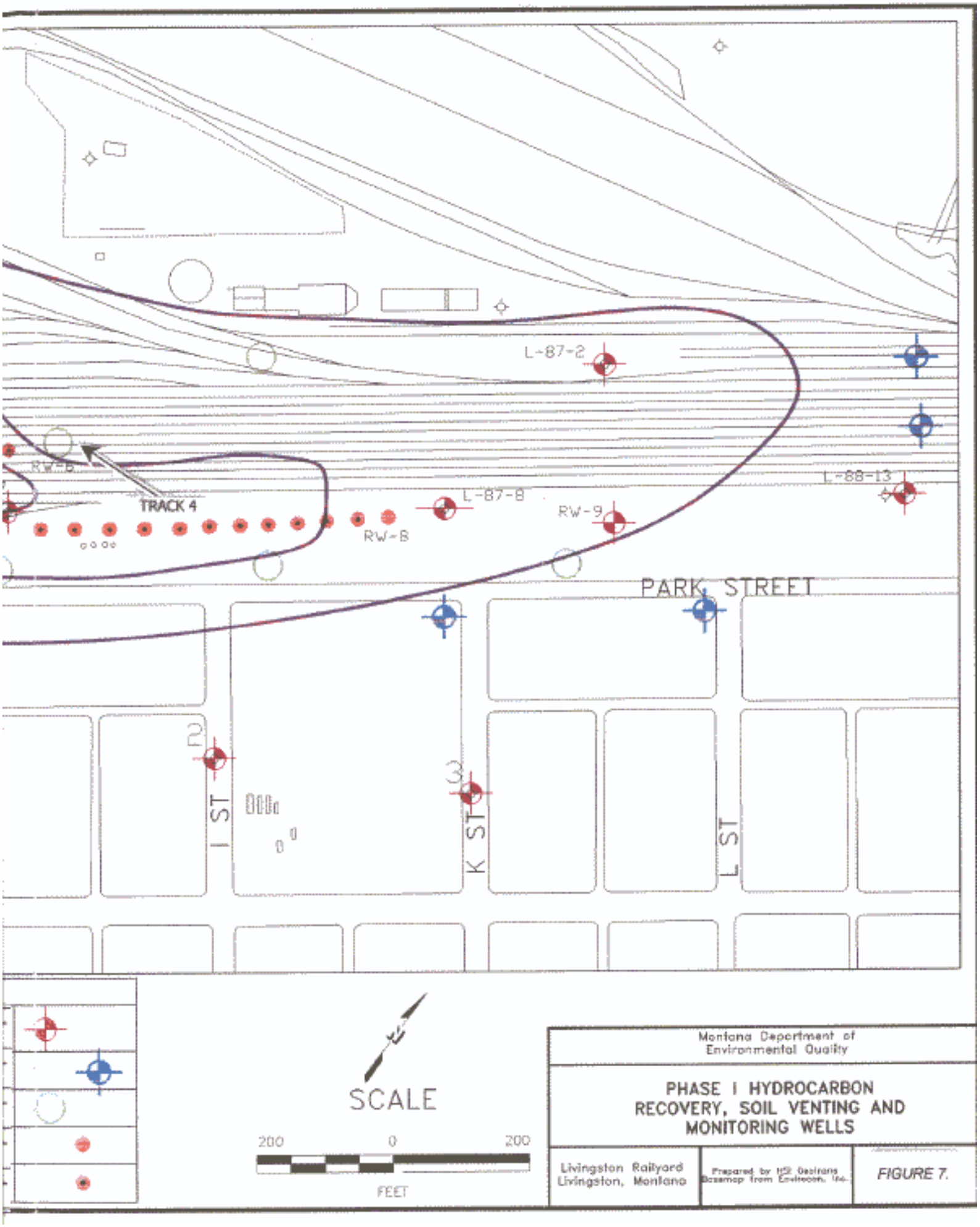
Figure 5. Primary Contaminant Transport Pathways at the BN Livingston Complex

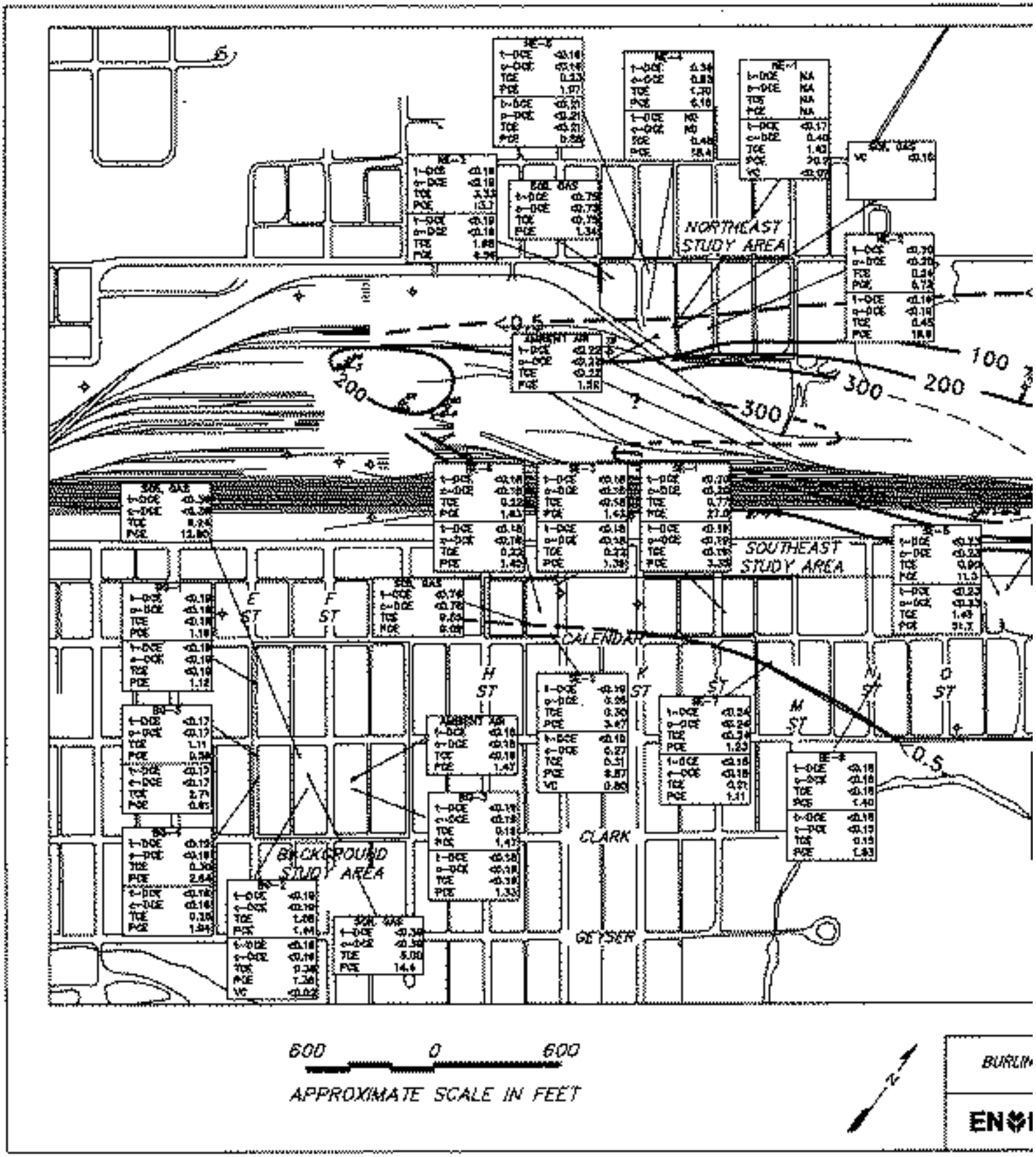


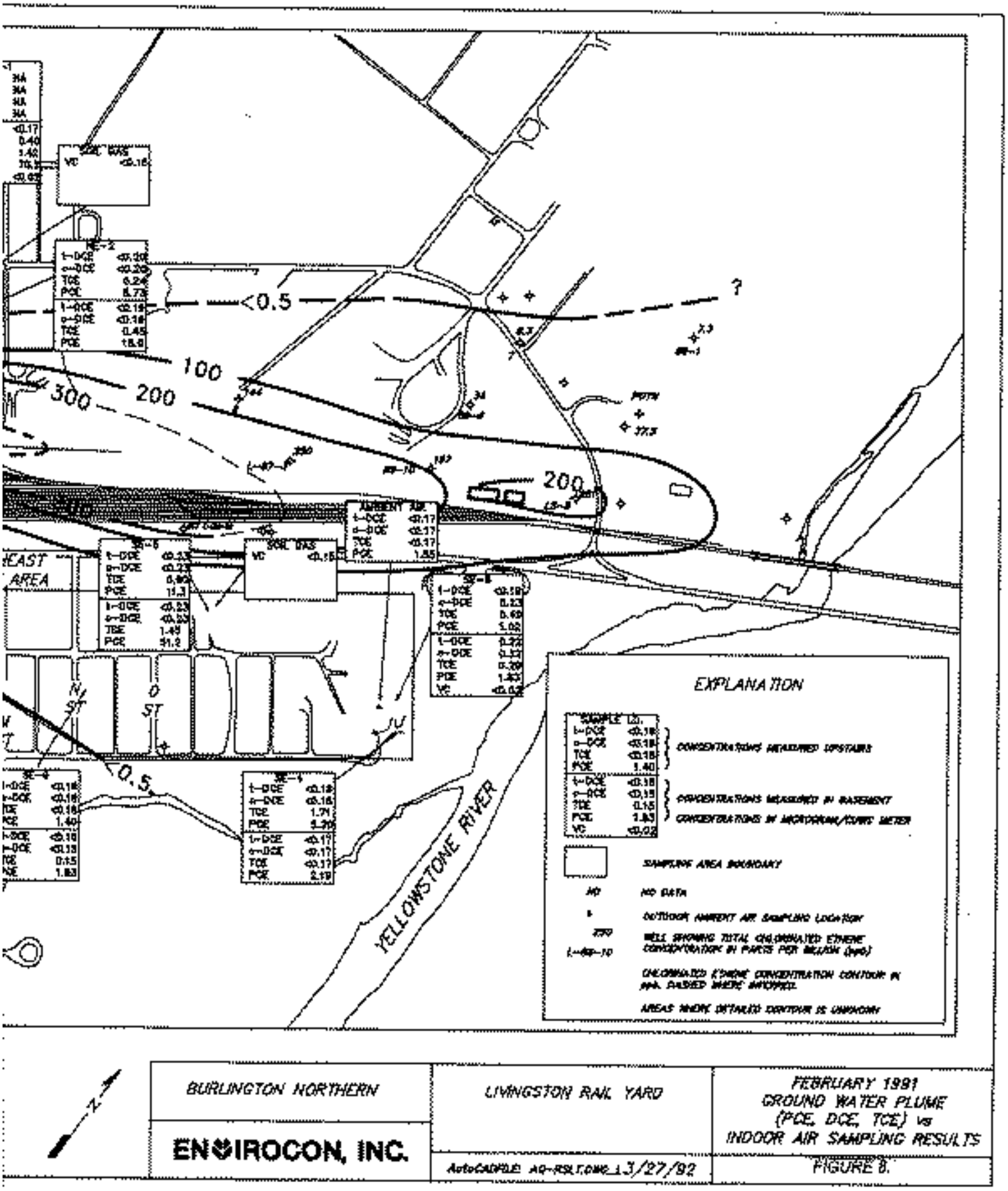

DEPOT FUELING FACILITY
FREIGHT TRAIN FUELING FACILITY
EXTENT OF ALLUVIUM CONTAINING RESIDUAL HYDROCARBONS AT THE WATER TABLE
WWTP
FREIGHT TRAIN FREE PRODUCT PLUME
LEWIS STREET
EXCAVATION SITE
B STREET
L STREET
MAIN LINE
HRD-5
HR-1D
HR-1W
L-87-4
HRD-4
HRD-6
HRD-7
TEST CELL 2
BLDG.
APPROX 40 FT
0
1000
SCALE IN FEET

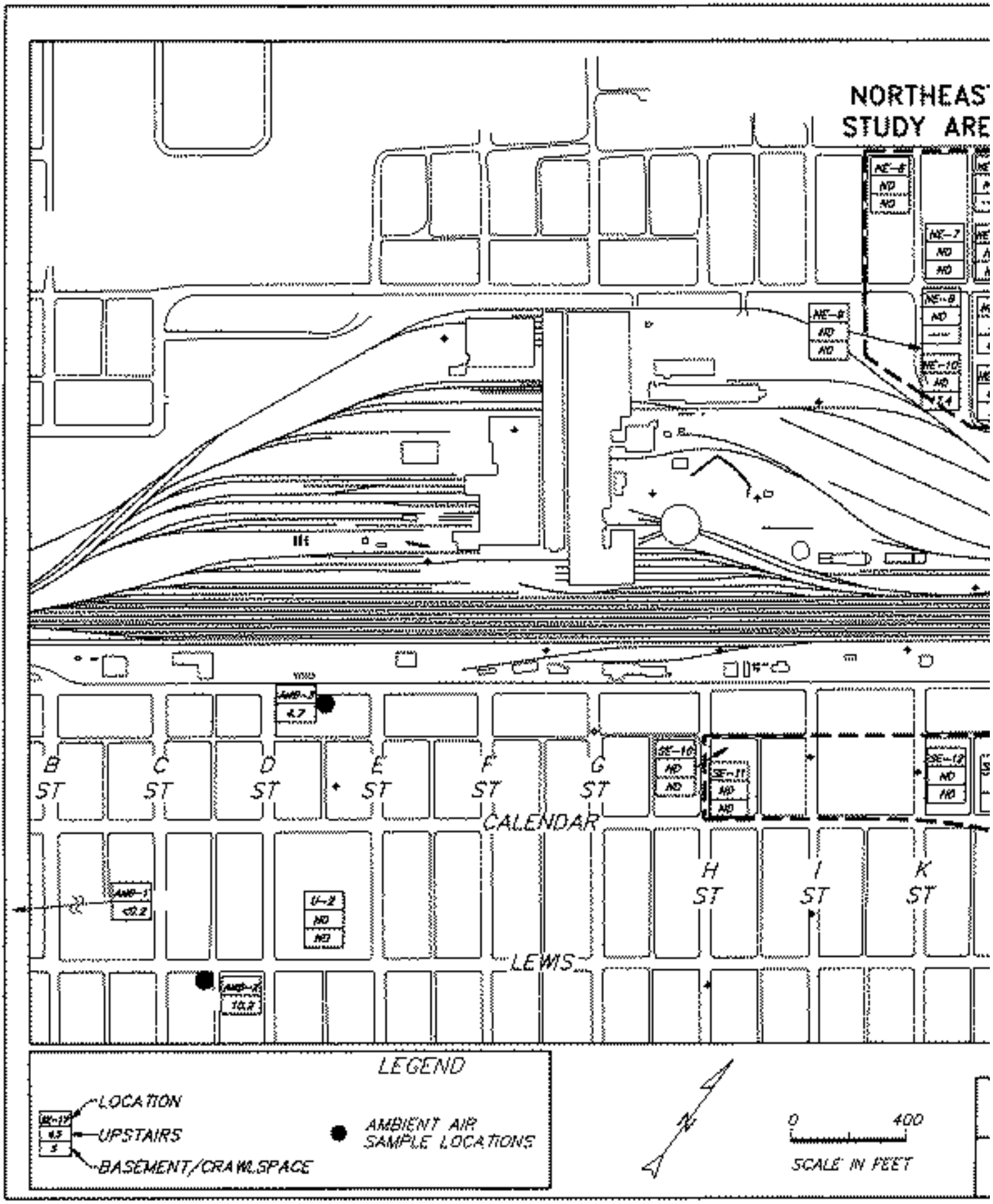

90-1
L-87-2
TEST CELLS 1 & 3
APPROX 60 FT.
WWTP
L-87-5
L-87-8
L-88-10
89-1
LS-8
LS-11
80-3
TRACK 11
EIGHT TRAIN
EL PRODUCT
UAE
EXCAVATION SITE
STREET
STREET
YELLOWSTONE RIVER
N
1000
SCALE IN FEET
BURLINGTON NORTHERN
ENVIROCON, INC.
HYDROCARBON SECTION
LIVINGSTON RAIL YARD
REMEDIAL INVESTIGATION
AutoCAD FILE: HRI-1.DWG_B
SITE MAP
LIVINGSTON, MT
7/19/91
FIGURE 6.

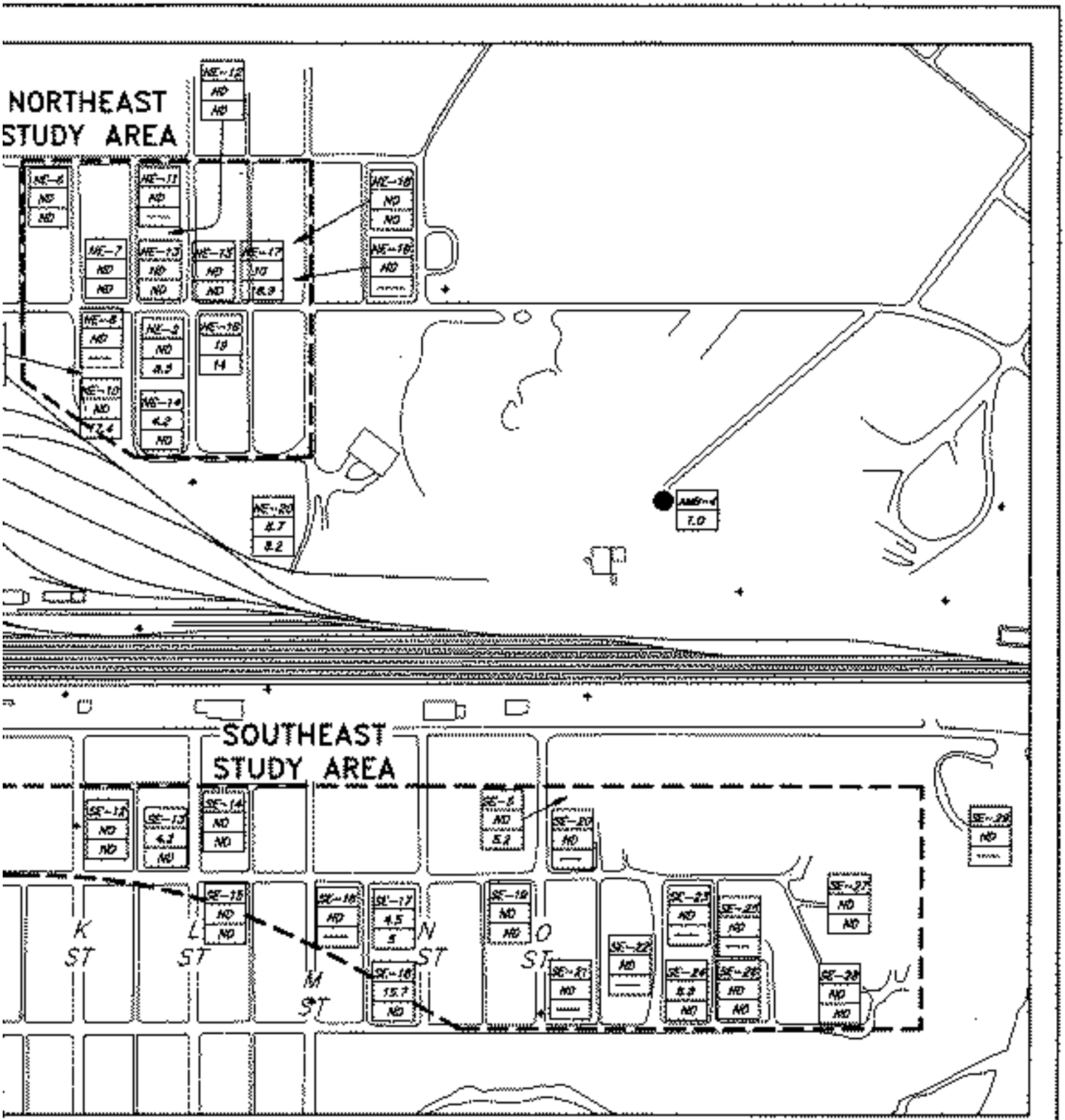

MRL TUNNEL
<0.1
0.5
1.0
PARK STREET
E ST
F ST
G ST
H ST
EXPLANATION
0.5 APPARENT FREE PRODUCT THICKNESS IN FEET
WELLS WITHOUT LABELS ARE PROPOSED LOCATIONS OF NEW WELLS. THESE LOCATIONS ARE SUBJECT TO CHANGE.
WELL TYPE
EXISTING MONITORING WELL
NEW MONITORING WELL
BIOVENTING WELL
EXISTING FREE PRODUCT RECOVERY WELL
NEW FREE PRODUCT RECOVERY WELL


L-87-2
RW-6
TRACK 4
L-87-8
RW-9
L-88-13
RW-8
PARK STREET
I ST
K ST
L ST
SCALE
200
0
200
FEET
Montana Department of Environmental Quality
PHASE I HYDROCARBON RECOVERY, SOIL VENTING AND MONITORING WELLS
Livingston Railyard
Livingston, Montana
Prepared by HSI Geotrans
Basemap from Envirocon, Inc.
FIGURE 7.

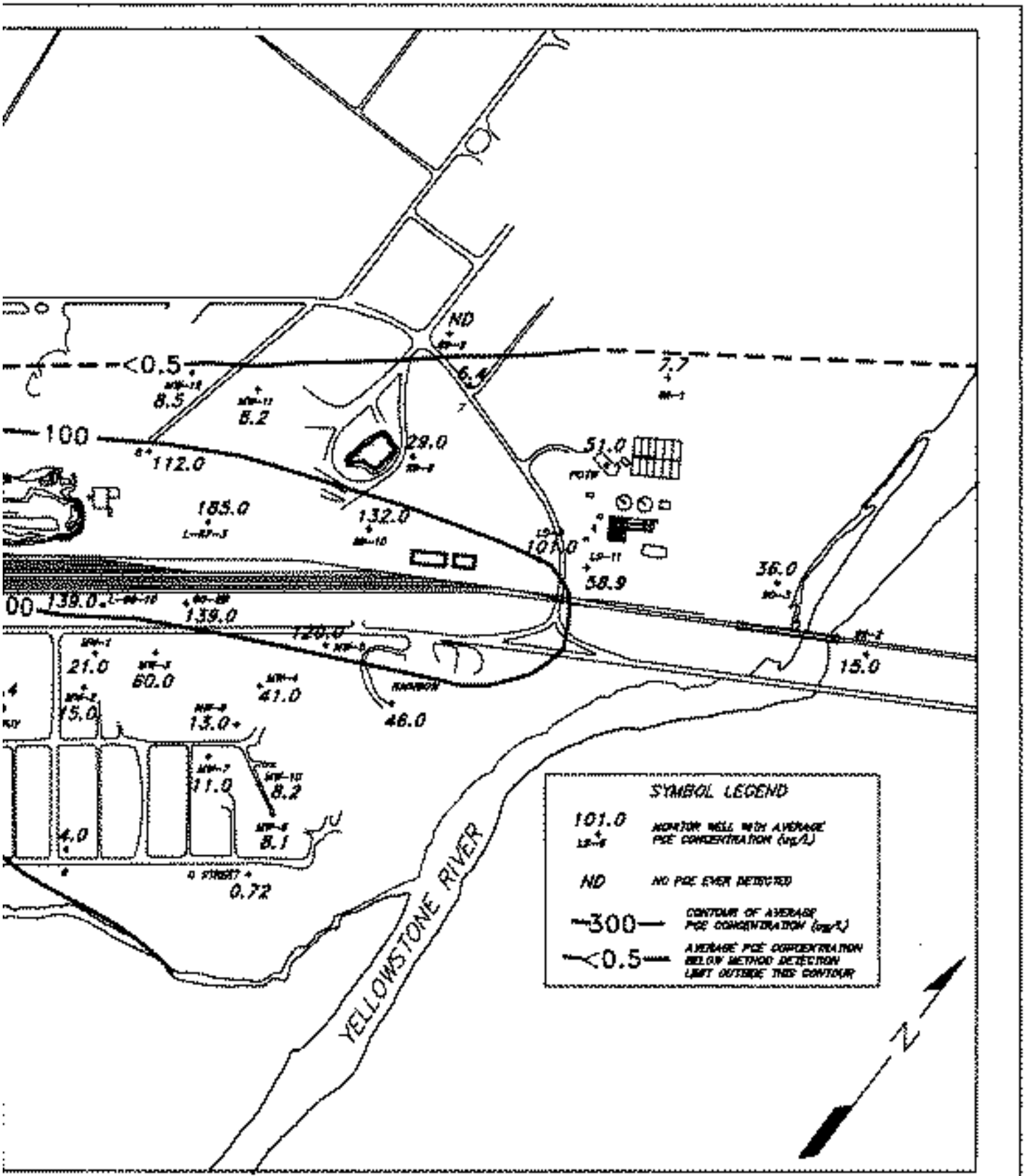

NORTHEAST
STUDY AREA
SOUTHEAST
STUDY AREA
BACKGROUND
STUDY AREA
E ST
F ST
H ST
K ST
M ST
N ST
O ST
CALENDAR
CLARK
GEYSER
100
200
300
600
0
600
APPROXIMATE SCALE IN FEET


<0.5
100
200
300
200
0.5
?
N ST
O ST
YELLOWSTONE RIVER
EAST AREA
EXPLANATION
CONCENTRATIONS MEASURED UPSTAIRS
CONCENTRATIONS MEASURED IN BASEMENT
CONCENTRATIONS IN MICROGRAMS/CUBIC METER
SAMPLING AREA BOUNDARY
ND NO DATA
OUTDOOR AMBIENT AIR SAMPLING LOCATION
WELL SHOWING TOTAL CHLORINATED ETHENE CONCENTRATION IN PARTS PER BILLION (ppb)
CHLORINATED ETHENE CONCENTRATION CONTOUR IN ppb. DASHED WHERE APPROX.
AREAS WHERE DETAILED CONTOUR IS UNKNOWN
BURLINGTON NORTHERN
LIVINGSTON RAIL YARD
FEBRUARY 1991 GROUND WATER PLUME (PCE, DCE, TCE) vs INDOOR AIR SAMPLING RESULTS
ENVIROCON, INC.
AutoCADFILE: AQ-RSLT.DWG 3/27/92
FIGURE 8.

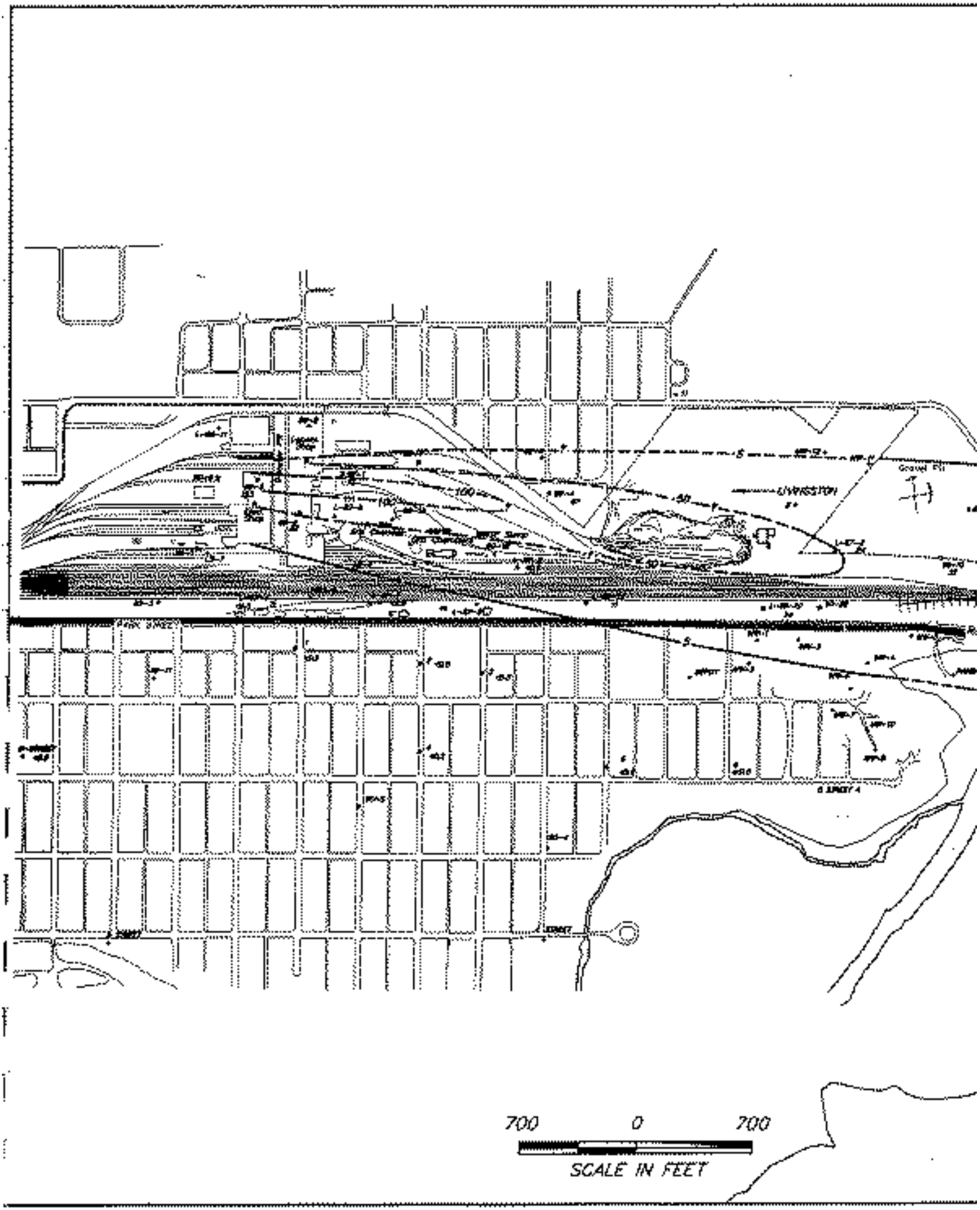

NORTHEAST
STUDY ARE
B ST
C ST
D ST
E ST
F ST
G ST
CALENDAR
H ST
I ST
K ST
LEWIS
LEGEND
LOCATION
UPSTAIRS
BASEMENT/CRAWLSPACE
AMBIENT AIR SAMPLE LOCATIONS
0
400
SCALE IN FEET

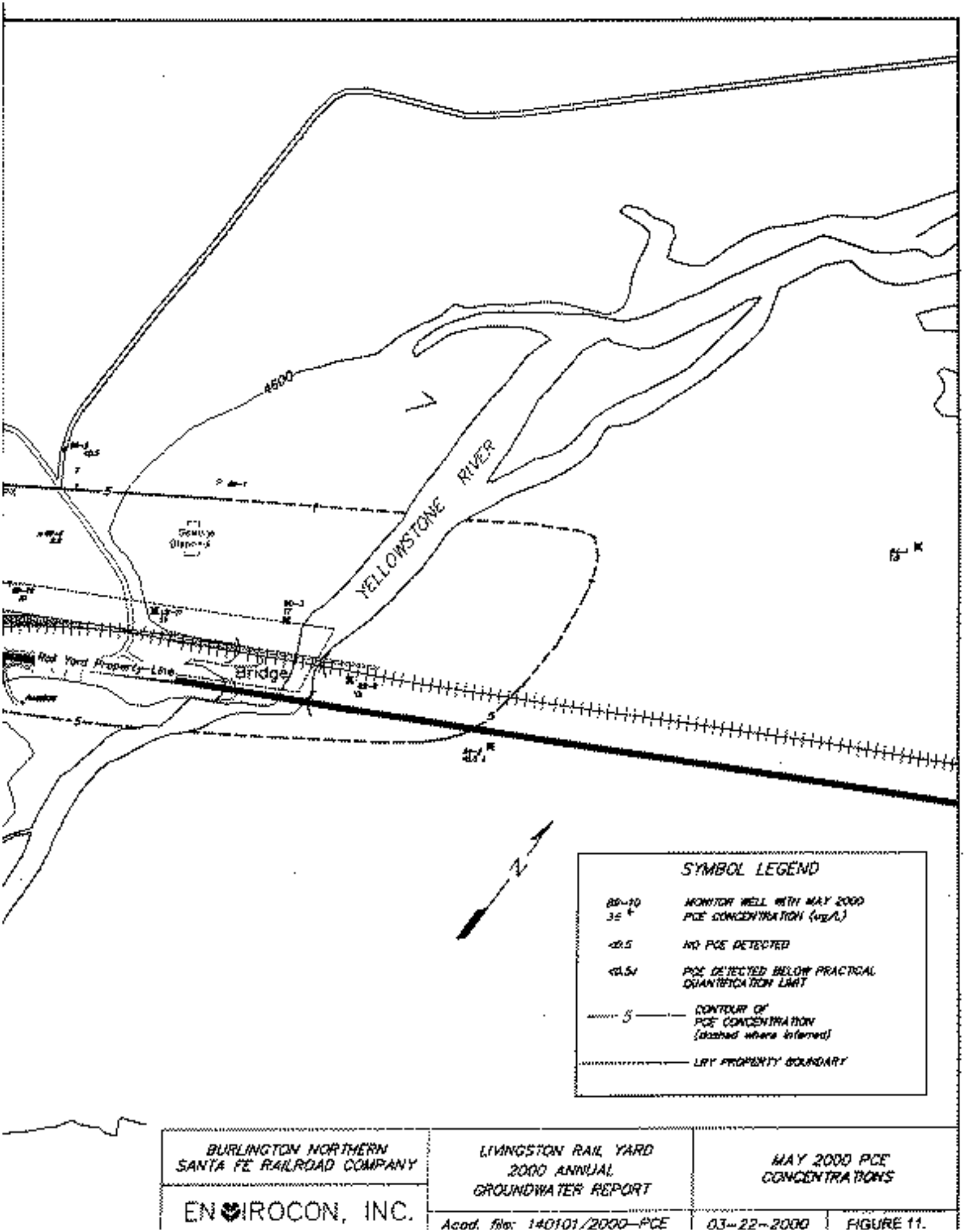


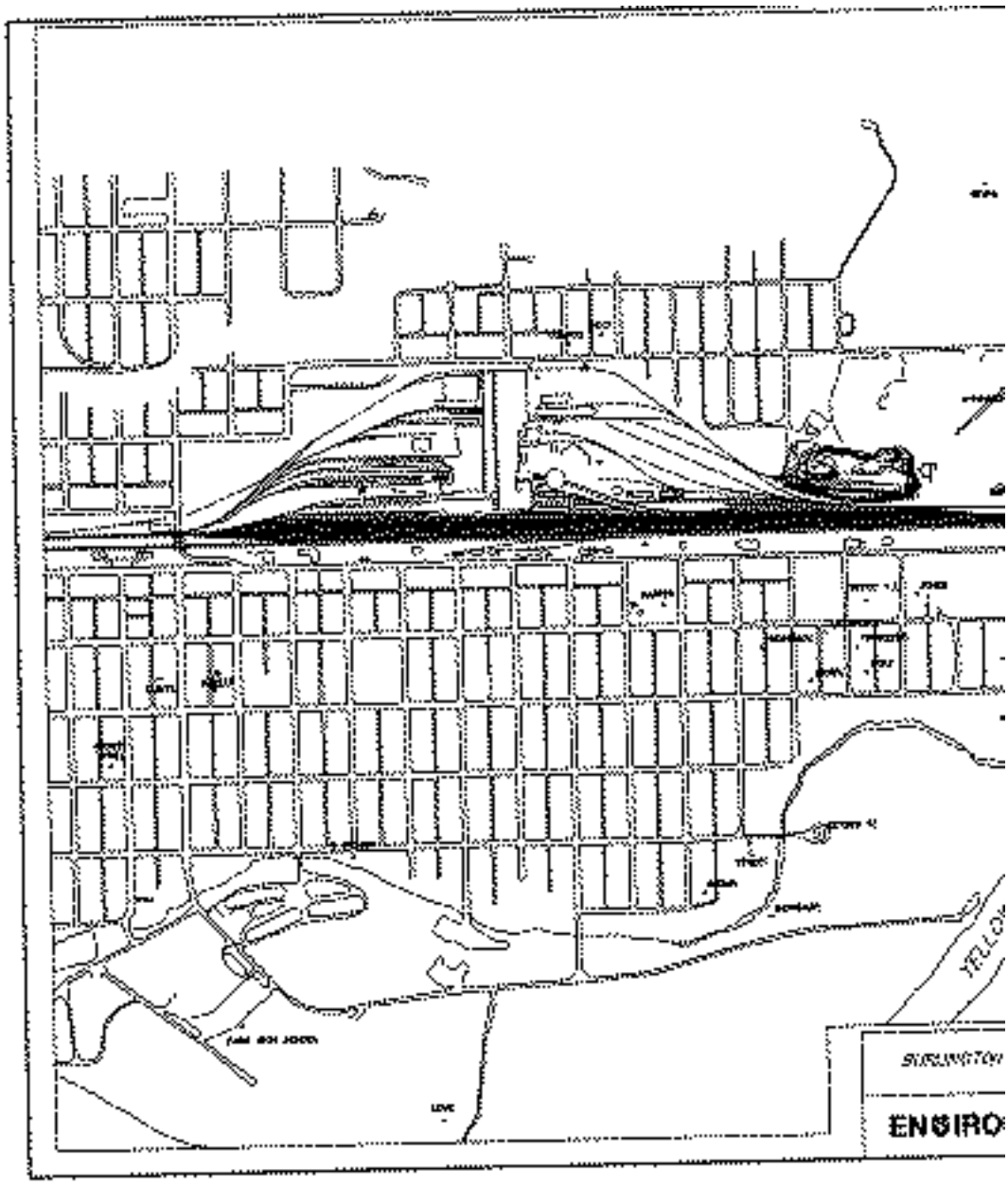
BURLINGTON NORTHERN	AIR SECTION LIVINGSTON RAIL YARD REMEDIAL INVESTIGATION	JANUARY/FEBRUARY 1993 INDOOR AIR SAMPLE LOCATIONS
ENVIROCON, INC.	AutoCad FILE: IN-AIR3.DWG	2/15/93 FIGURE 9

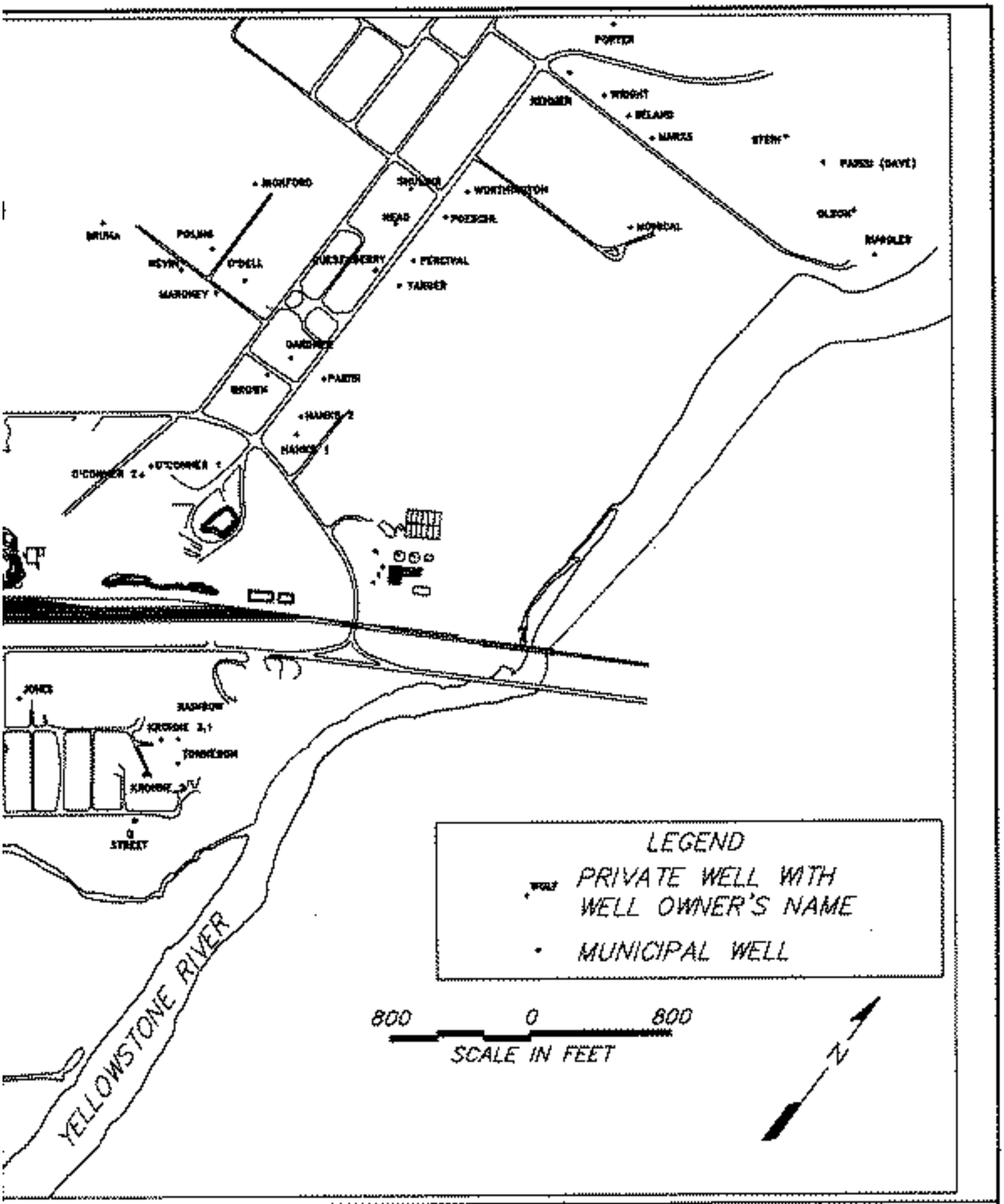


BURLINGTON NORTHERN	GROUND WATER SECTION LIVINGSTON RAIL YARD REMEDIAL INVESTIGATION	AVERAGE PCE CONCENTRATIONS MAY, 1989 – MAY, 1992
ENVIROCON, INC		


700
0
700
SCALE IN FEET

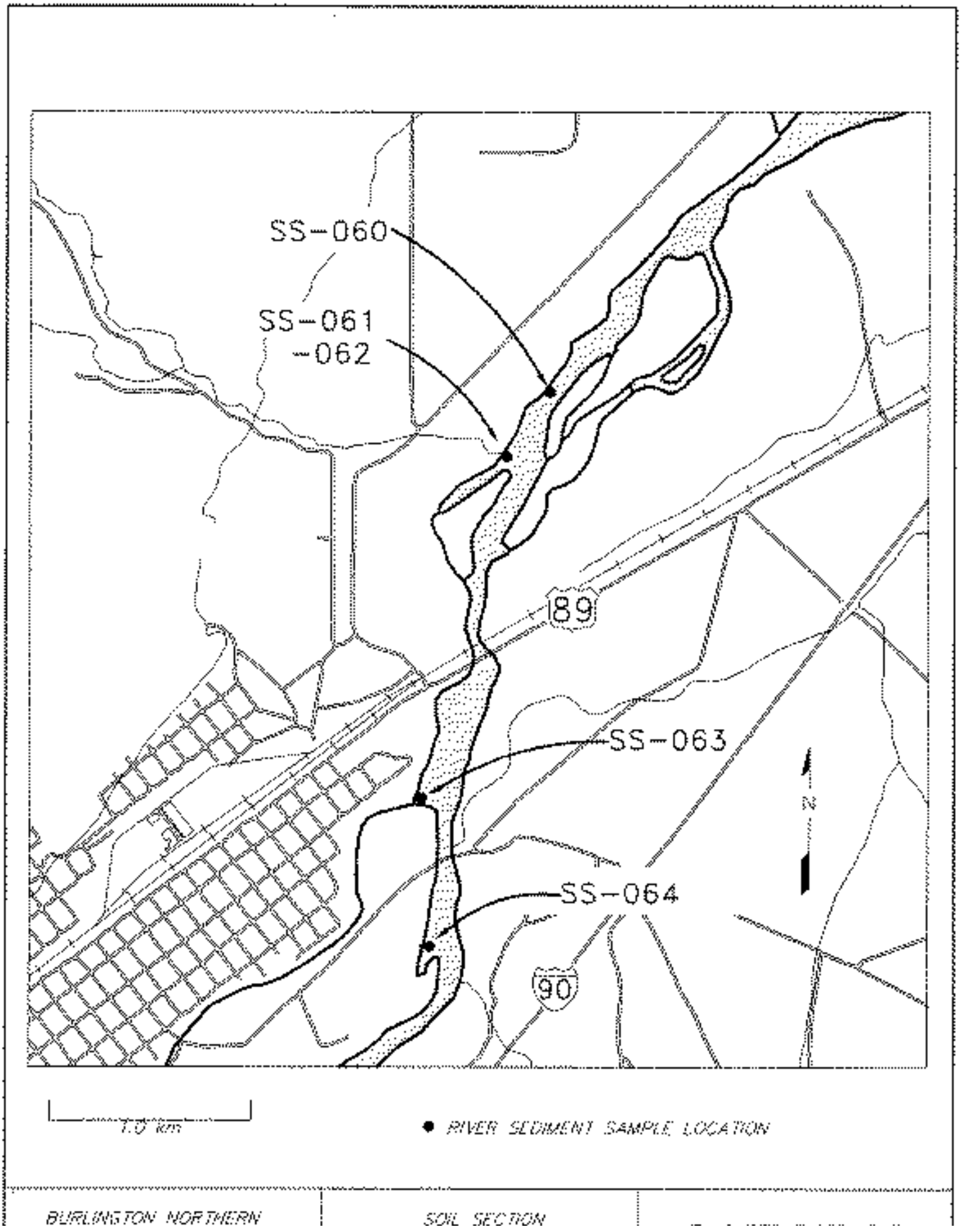

4600
YELLOWSTONE RIVER
Rail Yard Property Line
Bridge
SYMBOL LEGEND
MONITOR WELL WITH MAY 2000 PCE CONCENTRATION (ug/L)
ND PCE DETECTED
PCE DETECTED BELOW PRACTICAL QUANTITATION LIMIT
CONTOUR OF PCE CONCENTRATION (dashed where inferred)
LRY PROPERTY BOUNDARY
BURLINGTON NORTHERN SANTA FE RAILROAD COMPANY
LIVINGSTON RAIL YARD 2000 ANNUAL GROUNDWATER REPORT
MAY 2000 PCE CONCENTRATIONS
ENVIROCON, INC.
Acad. file: 140101/2000-PCE
03-22-2000
FIGURE 11.


ENGIRO

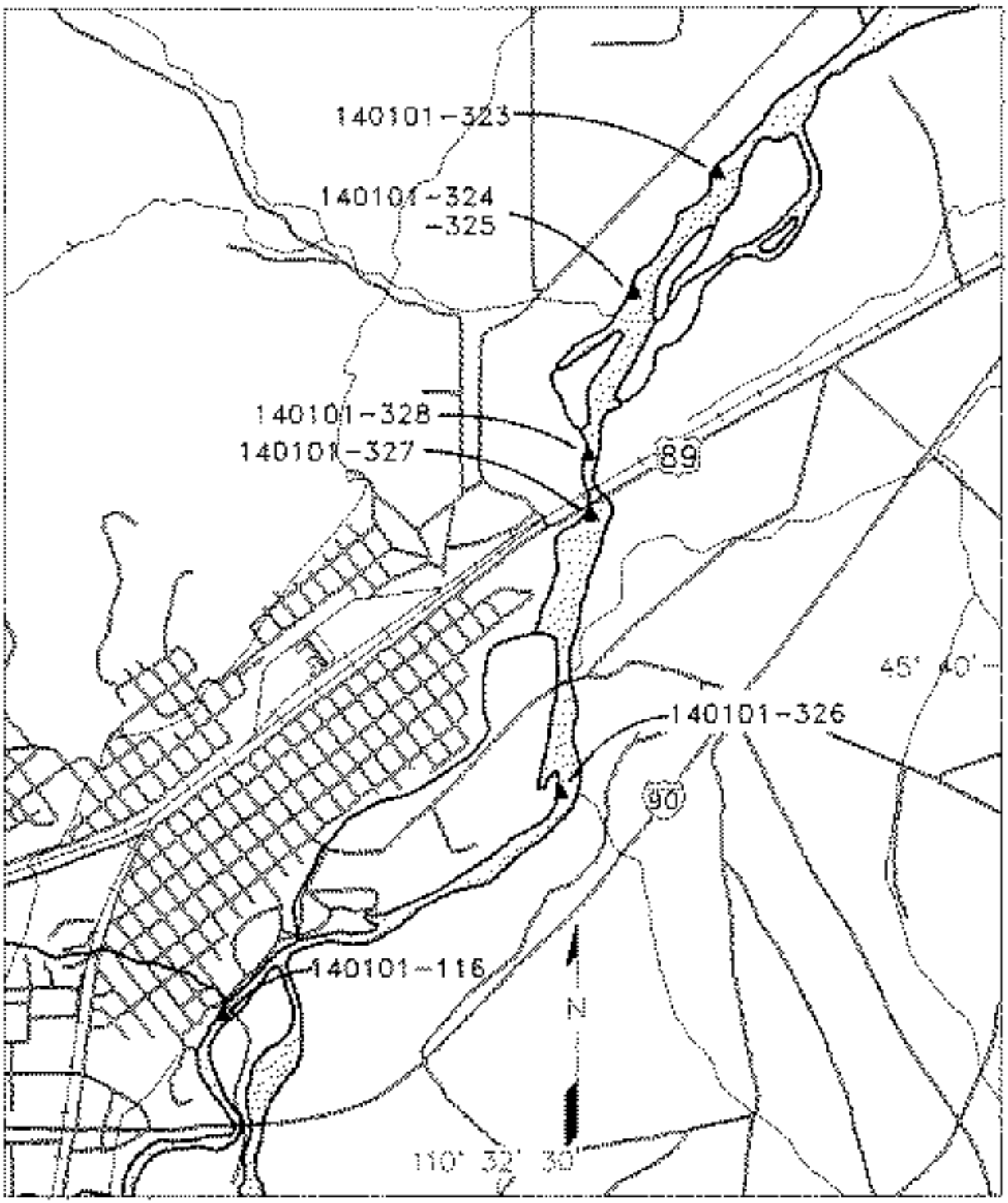


URLINGTON NORTHERN | GROUND WATER SECTION | MUNICIPAL WELL & PRIVATE WELL LOCATIONS

URLINGTON NORTHERN	GROUND WATER SECTION LIVINGSTON RAIL YARD REMEDIAL INVESTIGATION	MUNICIPAL WELL & PRIVATE WELL LOCATIONS
N♥IROCON, INC.	AutoCAD FILE: GWRI-22.DWG_C	8/27/92 | FIGURE 12.


SS-060
SS-061
-062
89
SS-063
SS-064
90
1.0 KM
RIVER SEDIMENT SAMPLE LOCATION
BURLINGTON NORTHERN
SOIL SECTION

BURLINGTON NORTHERN	SOIL SECTION LIVINGSTON RAIL YARD REMEDIAL INVESTIGATION	YELLOWSTONE SEDIMENT SAMPLE LOCATIONS
ENVIROCON, INC.	AutoCAD FILE: SRI-2.DWG_B	9/8/91 FIGURE 13.



BURLINGTON NORTHERN

GROUND WATER SECTION
LIVINGSTON RAIL YARD
REMEDIAL INVESTIGATION

YELLOWSTONE RIVER
WATER SAMPLE
NUMBERS & LOCATIONS

IDENTIFICATION AND DESCRIPTION OF LEGAL REQUIREMENTS

BURLINGTON NORTHERN
LIVINGSTON SHOP COMPLEX
CECRA SITE

RECORD OF DECISION

Montana Department of Environmental Quality

APPENDIX A

INTRODUCTION

Remedial actions undertaken pursuant to the Montana Comprehensive Environmental Cleanup and Responsibility Act (CECRA), ээ 75-10-701 through 75-10-724, Montana Code Annotated (MCA), must "attain a degree of cleanup of the hazardous or deleterious substance and control of a threatened release or further release of that substance that assures present and future protection of public health, safety, and welfare and of the environment." э 75-10-721(1), MCA. Additionally, the Montana Department of Environmental Quality (DEQ) "shall require cleanup consistent with applicable state or federal environmental requirements, criteria or limitations" and "shall consider and may require cleanup consistent with substantive state or federal environmental requirements, criteria, or limitations that are well-suited to the site conditions." э 75-10-721(2)(a) and (b), MCA.[1]

"Applicable" requirements are those that by their terms meet the jurisdictional prerequisites and apply to a given action, item or characteristic at the site. "Well-suited" requirements are those requirements that are not applicable, but address situations or problems sufficiently similar to those at the site that they are well-suited for use at the site. Attainment of both "applicable" requirements and designated "well-suited" requirements is equally mandatory under CECRA.

This document constitutes DEQ's formal identification and detailed description of ERCLs for the remedial action at the Burlington Northern Livingston Shop Complex Site.

Environmental requirements, criteria and limitations are generally of three types: contaminant-specific, location-specific, and action-specific. Contaminant-specific requirements are those that establish an allowable level or concentration of a hazardous or deleterious substance in the environment or that prescribe a level or method of treatment for a hazardous or deleterious substance. Action-specific requirements are those that are triggered by the performance of a certain activity as part of a particular remedy. Location-specific requirements are those that serve as restrictions on the concentration of a hazardous or deleterious substance or the conduct of activities solely because they are in specific locations or affect specified types of areas.

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1 When CECRA э 75-10-721 was amended during the 1995 legislative session, one of the revisions pertained to the development and selection of ERCLs. *see* Chapter 584, Laws of Montana, 1995. However, Section 15 of Chapter 584 states that the 1995 revisions and amendments do not apply to civil actions commenced or begun prior to the effective date of the 1995 act [May 1, 1995] or to claims based on those actions.

The complaint in State of Montana v. Burlington Northern, Inc., Burlington Northern Railroad Company and Glacier Park Company CV 88-141-H-CCL was filed December 27, 1988 and pertains to the Burlington Northern Livingston Railyard Site, Mission Wye site and other Burlington Northern Facilities. Therefore, these ERCLs comply with CECRA as amended in 1991, rather than CECRA as amended by Chapter 584, Laws of Montana, 1995. The 1997 and 1999 Montana legislatures did not alter the role of ERCLs.

In the analysis below, federal and state contaminant-specific and action-specific requirements are presented together, because they present similar or overlapping requirements.

The standards for off-site disposal are not ERCLs, but are instead independently applicable laws. For off-site actions, all standards, both substantive and procedural must be met. Under CECRA, neither permit exemptions nor waivers are allowed under the law for off-site actions. Off-site disposal will be coordinated with the pertinent regulatory bureaus at DEQ. The "Other Laws" section at the end of the ERCLs lists certain laws which are independently applicable regarding the remedial action.

The description of applicable and well-suited federal and state requirements which follows includes summaries of the legal requirements which attempt to set out the requirement in a reasonably concise fashion that is useful in evaluating compliance with the requirement. These descriptions are provided to allow the user a basic indication of the requirement without having to refer constantly back to the statute or regulation itself. However, in the event of any inconsistency between the law itself and the summaries provided in this document, the actual requirement is ultimately the requirement as set out in the law, rather than any paraphrase of the law provided here.

In many cases, the State has essentially adopted certain federal regulations or incorporated by reference certain federal regulations into the State regulations. In those cases, the ERCL may be listed in the federal section with the State adoption noted.

This document constitutes DEQ's formal identification and detailed description of ERCLs for remedial action at the Burlington Northern Livingston Shop Complex CECRA Site. This ERCLs analysis is based on э 75-10-721, MCA, section 121(d) of CERCLA, 42 U.S.C. э 9621(d); CERCLA Compliance with Other Laws Manual, Volumes I and II, OSWER Dirs. 9234.1-01 and-02 (August 1988 and August 1989 respectively); various CERCLA ARARs Fact Sheets issued as OSWER Directives; the Preamble to the Proposed NCP, 53 Fed. Reg. 51394 et seq. (December 21, 1988); the Preamble to the Final NCP, 55 Fed. Reg. 8666-8813 (March 8, 1990); the Final NCP, 40 CFR Part 300 (55 Fed. Reg. 8813-8865, March 8, 1990). This ERCLs analysis is also based on the provisions of law discussed in this document.

I. FEDERAL AND STATE CONTAMINANT SPECIFIC ERCLs

CONTAMINANT SPECIFIC ERCLs

Surface and Groundwater Quality Standards (Applicable)

Causing of pollution

Section 75-5-605 of the Montana Water Quality Act prohibits the causing of pollution of any state waters. Section 75-5-103(21)(a)(i) defines pollution as contamination or other alteration of physical,

chemical, or biological properties of state waters which exceeds that permitted by the water quality standards.

Placement of Wastes

Section 75-5-605, MCA states that it is unlawful to place or cause to be placed any wastes where they will cause pollution of any state waters. Any permitted placement of waste is not placement if the agency's permitting authority contains provisions for review of the placement of materials to ensure it will not cause pollution to state waters.

Nondegradation

Section 75-5-303, MCA states that existing uses of state waters and the level of water quality necessary to protect the uses must be maintained and protected, with certain limited exceptions.

Groundwater Quality Standards

Maximum Contaminant Levels and Maximum Contaminant Level Goals (Well-Suited)

Because the aquifer affected by the site is currently and has been used as a drinking water source, the MCLs and non-zero MCLGs specified in 40 CFR Part 141 (Primary Drinking Water Standards) are well-suited requirements which are ultimately to be attained by the remedy for the site.[2] Because many of the MCLs are equivalent with the State groundwater standards, the Primary Drinking Water Standards are listed below with the State groundwater standards.

Secondary Maximum Contaminant Levels (Well-Suited)

Because the aquifer affected by the site is currently and has been used as a drinking water source, the Secondary Maximum Contaminant Levels (SMCLs) specified in 40 CFR Part 143.3 are well-suited requirements which are ultimately to be attained by the remedy for the site. 40 CFR 143.3 contains standards for color, odor (3 threshold odor number) and corrosivity which are well-suited to the remedial action.

Montana Groundwater Pollution Control System (Applicable)

ARM 17.30.1006 classifies groundwater into Classes I through IV based upon its specific conductance and establishes the groundwater quality standards applicable with respect to each groundwater classification.

[2] Montana Maximum Contaminant Levels:

Pursuant to the Public Water Safety Act, 75-6-101 et. seq., MCA and ARM 17.38.204, the MCLs specified in 40 CFR Part 141 (Primary Drinking Water Standards) are incorporated.

Based upon its specific conductance, the groundwater at the site must meet the standards for Class I groundwater. These standards are applicable. Concentrations of substances in Class I may not exceed the human health standards for groundwater listed in department Circular WQB-7.[3] For the primary contaminants of concern, the Circular WQB-7 standards and MCLs are listed below. For all contaminants of concern except vinyl chloride, the MCLs and Circular WQB-7 standards are equivalent.[4] All levels are ug/l and are dissolved phase.

VOCs:

Tetrachloroethene	5.0
Trichloroethene	5.0
Cis-1,2-Dichloroethene	70
Vinyl chloride	0.15
Chlorobenzene	100
1,4-Dichlorobenzene	75

PAHs (SVOCs):

Acenaphthene	420
Anthracene	2100
Benz(a)anthracene	0.48
Benzo(a)pyrene	0.048
Benzo(b)fluoranthene	0.48
Benzo(k)fluoranthene	4.79
Chrysene	48
Dibenzo(a,h)anthracene	0.048
Fluoranthene	280
Fluorene	280
Indeno(1,2,3-cd)pyrene	0.48
Naphthalene	28
Pyrene	210

Lead	15

3 Montana Department of Environmental Quality, Planning, Prevention and Assistance Division, Circular WQB-7, Montana Numeric Water Quality Standards (September, 1999).

4 For vinyl chloride, the WQB-7 standard is 0.15 ug/l; the MCL is 2 ug/l.

For concentrations of parameters for which human health standards are not listed in WQB-7, ARM 17.30.1006 allows no increase of a parameter to a level that renders the waters harmful, detrimental or injurious to the beneficial uses listed for Class I water. This includes the following petroleum constituents. All levels are µg/l and are dissolved phase.

ARM 17.30.1011 provides that any groundwater whose existing quality is higher than the standard for its classification must be maintained at that high quality unless degradation may be allowed under the principles established in ə 75-5-303, MCA, and the nondegradation rules at ARM Title 17, chapter 30, subchapter 7.

Surface Water Quality Standards (Applicable)

The Montana Water Quality Act, əə 75-5-101 et seq., establishes requirements for restoring and maintaining the quality of surface and ground waters and the federal Clean Water Act, 33 U.S.C. əə 1251 et seq., establishes requirements for restoring and maintaining the quality of surface waters. Under these Acts the state has authority to adopt water quality standards designed to protect beneficial uses of each water body and to designate uses for each water body. Montana's regulations classify state waters according to quality, place restrictions on the discharge of pollutants to state waters and prohibit the degradation of state waters.

ARM 17.30.611(1) (Applicable) provides that the waters of the Yellowstone River drainage upstream of the Laurel water supply intake, which includes the Livingston area, are classified "B-1" for water use.

ARM 17.30.623 provides that concentrations of carcinogenic, bioconcentrating, toxic or harmful parameters which would remain in the water after conventional water treatment may not exceed the applicable standards set forth in department circular WQB-7.

WQB-7 provides that AFor surface waters the Standard is the more restrictive of either the Aquatic Life Standard or the Human Health Standard.≅ For the primary Contaminants of Concern the Circular WQB-7 standards are the same as listed above in groundwater.

The B-1 classification standards at ARM 17.30.623 also include the following criteria: 1) Dissolved oxygen concentration must not be reduced below the levels given in department circular WQB-7; 2) Hydrogen ion concentration (pH) must be maintained within the range of 6.5 to 9.5; 3) the maximum allowable increase above naturally occurring turbidity is 5 nephelometric turbidity units; 4) Temperature increases must be kept within prescribed limits; 5) No increase are allowed above naturally occurring concentrations of sediment, settleable solids, oils, floating solids, which will or is likely to create a nuisance or render the waters harmful, detrimental, or injurious to public health, recreation, safety, welfare, livestock, wild animals, birds, fish or other wildlife. 6) True color must be kept within specified limits.

ARM 17.30.637 which prohibits discharges containing substances that will: (a) settle to form objectionable sludge deposits or emulsions beneath the surface of the water or upon adjoining shorelines; (b) create floating debris, scum, a visible oil film (or be present in concentrations at or in excess of 10 milligrams per liter) or globules of grease or other floating materials; (c) produce odors, colors or other conditions which create a nuisance or render undesirable tastes to fish flesh or make fish inedible; (d) create concentrations or combinations of materials which are toxic or harmful to human, animal, plant or aquatic life; (e) create conditions which produce undesirable aquatic life.

ARM 17.30.705 provides that for any surface water, existing and anticipated uses and the water quality necessary to protect these uses must be maintained and protected unless degradation is allowed under the nondegradation rules at ARM 17.30.708.

Stormwater Runoff (Applicable)

Pursuant to authority under the Water Quality Act, Title 17, Chapter 30, Sub-Chapter 6, and Title 17, Chapter 30, Sub-Chapter 13, including ARM 17.30.1332, the Water Quality Division issues general stormwater permits for certain activities. For construction activities, the following permit must be obtained: General Discharge Permit for Storm Water Associated with Construction Activity, Permit No. MTR100000 (May 19, 1997).

Generally, the permits require the permittee to implement Best Management Practices (BMP) and to take all reasonable steps to minimize or prevent any discharge which has a reasonable likelihood of adversely affecting human health or the environment. However, if there is evidence indicating potential or realized impacts on water quality due to any storm water discharge associated with the activity, an individual MPDES permit or alternative general permit may be required.

Ambient Air Quality Standards (Applicable)

The following standards are applicable at the site[5]:

40 CFR 50.12 and ARM 17.8.222. Ambient air quality standard for lead. Lead concentrations in the ambient air shall not exceed the following 90-day average: 1.5 micrograms lead per cubic meter of air.

40 CFR 50.9 and ARM 17.8.213. Ambient air quality standard for ozone. No person shall cause or contribute to concentrations of ozone in the ambient air exceeding: 0.10 ppm 1-hour average

[5] Each of the ambient air quality standards includes in its terms specific requirements and methodologies for monitoring and determining levels. Such requirements are also applicable requirements. In addition, ARM 17.8.204 and 17.8.206, Ambient Air Monitoring; Methods and Data, respectively (Applicable), require that all ambient air monitoring, sampling and data collection, recording, analysis and transmittal shall be in compliance with the Montana Quality Assurance Manual except when more stringent requirements are determined by DEQ to be necessary.

(0.12 ppm federal standard). 40 CFR 50.10 establishes a daily maximum 8-hour average 0.08 parts per million (ppm).

ARM 17.8.220. Ambient air quality standard for settled particulate matter. Particulate matter concentrations in the ambient air shall not exceed the following 30-day average: 10 grams per square meter.

40 CFR 50.6 and ARM 17.8.223. Ambient air quality standards for PM-10. PM-10 concentrations in the ambient air shall not exceed the following standards: 150 micrograms/cubic meter of air, 24-hour average; and 50 micrograms/cubic meter of air, expected annual average.

40 CFR 50.8 and ARM 17.8.212. Ambient air quality standards for carbon monoxide. Carbon monoxide concentrations in the ambient air shall not exceed the following standards: 9 ppm 8-hour average; and 23 ppm for a 1-hour average (35 ppm for federal).

Emission Standards (Applicable)

Montana has promulgated standards to regulate emissions of certain contaminants into the air. The state emission standards are enforceable under the Montana Clean Air Act, ээ 75-2-101 et seq., MCA.

ARM 17.8.304. Visible Air Contaminants. No source may discharge emissions into the atmosphere that exhibit an opacity of 20 percent or greater, averaged over six consecutive minutes. This standard is limited to point sources, but excludes wood waste burners, incinerators, and motor vehicles.

ARM 17.8.308. Airborne Particulate Matter. Emissions of airborne particulate matter from any stationary source shall not exhibit an opacity of 20 percent or greater, averaged over six consecutive minutes. This standard applies to the production, handling, transportation, or storage of any material; to the use of streets, roads, or parking lots; and to construction or demolition projects.

ARM 17.8.315. Odors. If a business or other activity will create odors, those odors must be controlled, and no business or activity may cause a public nuisance.

ARM 17.8.604. Prohibited open burning. Open burning of numerous specific materials, including but not limited to oil and petroleum products and hazardous wastes, is prohibited.

ARM 17.8.705 requires that permits be obtained for the construction, installation, alteration, or use of specified air contaminant sources. All air permits required for remedial actions must be obtained.

ARM 17.8.715 requires sources for which air quality permits are required to use best available control technology (BACT) or to meet the lowest achievable emission rate (LAER), as applicable.

II. FEDERAL LOCATION SPECIFIC ERCLs

Criteria for Classification of Solid Waste Disposal Facilities and Practices (Applicable and Well-Suited)

Under the selected remedy, no solid or hazardous waste (other than media treated to cleanup levels) may be disposed on-site. The standards therefore are pertinent to the cinder pile (well-suited) and placement of ex situ soils treated to cleanup levels (applicable) and post-jurisdictional wastes (applicable).

The criteria contained in 40 CFR Part 257, establish standards with which solid waste disposal must comply to avoid possible adverse effects on health or the environment. 40 CFR Part 257 includes the following standards: Section 257.3-1(a) requires that facilities or practices in the floodplain not result in the washout of solid waste so as to pose a hazard to human life, wildlife, or land or water resources. Section 257.3-2 provides for the protection of threatened or endangered species. Section 257.3-3 provides that a facility shall not cause the discharge of pollutants into waters of the United States. Section 257.3-4 states that a facility or practice shall not contaminate underground drinking water.

The Endangered Species Act (Well-Suited)

This statute and implementing regulations (16 U.S.C. § 1531 et seq., 50 CFR Part 402, 40 CFR 6.302(h), and 40 CFR 257.3-2) require that any federal activity or federally authorized activity may not jeopardize the continued existence of any threatened or endangered species or destroy or adversely modify a critical habitat. Compliance with this requirement involves consultation with the U.S. Fish and Wildlife Service (USFWS) and a determination of whether there are listed or proposed species or critical habitats present at the Site, and, if so, whether any proposed activities will impact such wildlife or habitat. No endangered or threatened species was identified on-site although the Yellowstone Trout is treated as a species of special concern by the State. Any action affecting federal or State endangered or threatened species must comply with all listed requirements.

Sections 87-5-106, 107, and 111, MCA (Applicable): Endangered species should be protected in order to maintain and to the extent possible enhance their numbers. These sections list endangered species, prohibited acts and penalties. See also, §§ 87-5-106 and 87-5-201, MCA, (Applicable) concerning protection of wild birds, nests and eggs.

ARM 12.5.201 (Applicable). Certain activities are prohibited with respect to specified endangered species.

Migratory Bird Treaty Act (Well-Suited) This requirement (16 U.S.C. § 703 et seq.) establishes a federal responsibility for the protection of the international migratory bird resource and requires continued consultation with the USFWS during remedial design and remedial action to ensure that

the cleanup of the site does not unnecessarily impact migratory birds.

Bald Eagle Protection Act (Well-Suited) This requirement (16 U.S.C. § 668 et seq.) establishes a federal responsibility for protection of bald and golden eagles, and requires continued consultation with the USFWS during remedial design and remedial action to ensure that any cleanup of the site does not unnecessarily adversely affect the bald and golden eagle.

Historic Sites, Buildings, Objects and Antiquities Act (Well-Suited) These requirements, found at 16 U.S.C. 461 et seq., provide that, in conducting an environmental review of a proposed action, the responsible official shall consider the existence and location of natural landmarks using information provided by the National Park Service pursuant to 36 CFR 62.6(d) to avoid undesirable impacts upon such landmarks. No historic sites were identified.

Fish and Wildlife Coordination Act (Well-Suited) These standards are found at 16 U.S.C. § 661 et seq. and 40 CFR 6.302(g) and require that federally funded or authorized projects ensure that any modification of any stream or other water body affected by a funded or authorized action provide for adequate protection of fish and wildlife resources.

Floodplain Management Order (Well-Suited) This requirement (40 CFR Part 6, Appendix A, Executive Order No. 11,988) mandates that federally funded or authorized actions within the 100 year flood plain avoid, to the maximum extent possible, adverse impacts associated with development of a floodplain.

Protection of Wetlands Order (Well-Suited) This requirement (40 CFR Part 6, Appendix A, Executive Order No. 11,990) mandates that federal agencies and potentially responsible parties avoid, to the extent possible, the adverse impacts associated with the destruction or loss of wetlands and to avoid support of new construction in wetlands if a practicable alternative exists. Section 404(b)(1), 33 U.S.C. § 1344(b)(1), also prohibits the discharge of dredged or fill material into waters of the United States. Together, these requirements create a "no net loss" of wetlands standard.

III. STATE LOCATION SPECIFIC ERCLs

Solid Waste Management Regulations (Applicable and Well-Suited)

Regulations promulgated under the Solid Waste Management Act, ээ 75-10-201 et seq., MCA, specify requirements that apply to the location of any solid waste management facility. Under the selected remedy, no solid or hazardous waste (other than media treated to cleanup levels) may be disposed on-site. The standards therefore are pertinent to the cinder pile (well-suited) and placement of ex situ soils treated to cleanup levels (applicable) and post-jurisdictional wastes (applicable).

Under ARM 17.50.505(1), a facility for the treatment, storage or disposal of solid wastes:

> (a) must be located where a sufficient acreage of suitable land is available for solid waste management;
>
> (b) may not be located in a 100-year floodplain;
>
> (c) may be located only in areas which will prevent the pollution of ground and surface waters and public and private water supply systems;
>
> (d) must be located to allow for reclamation and reuse of the land;
>
> (e) drainage structures must be installed where necessary to prevent surface runoff from entering waste management areas; and
>
> (f) where underlying geological formations contain rock fractures or fissures which may lead to pollution of the ground water or areas in which springs exist that are hydraulically connected to a proposed disposal facility, only Class III disposal facilities may be approved.

Floodplain and Floodway Management Act and Regulations (Applicable)

A portion of the site is in a designated floodplain. The following standards are included here to indicate the restrictions on any related activities that might occur in or affect the floodway or floodplain.

Residential, certain agricultural, industrial-commercial, recreational and other uses are permissible within the designated floodway, provided they do not require structures other than portable structures, fill or permanent storage of materials or equipment. ə 76-5-401, MCA; ARM 36.15.601.

In the flood fringe (i.e., within the floodplain but outside the floodway), residential, commercial, industrial, and other structures may be permitted subject to certain conditions relating to placement of fill, roads, and floodproofing. ə 76-5-402, MCA; ARM 36.15.701.

Domestic water supply wells may be permitted, even within the floodway, provided the well casing and well meets certain conditions. ARM 36.15.602(6).

Solid and hazardous waste disposal and storage of toxic, flammable, hazardous, or explosive materials are prohibited anywhere in floodways or floodplains. ARM 36.15.602(5), 36.15.605, and 36.15.703.

The following are prohibited in a floodway: buildings for living purposes or place of assembly or permanent use by human beings; any structure or excavation that will cause water to be diverted from the established floodway, cause erosion, obstruct the natural flow of water, or reduce the

carrying capacity of the floodway; and the construction or permanent storage of an object subject to flotation or movement during flood level periods. ə 76-5-402, MCA.

ə 76-5-406, MCA and ARM 36.15.216 contain substantive factors which address obstruction or use within the floodway or floodplain.

Further conditions or restrictions that generally apply to specific activities within the floodway or floodplain can be found at ARM 36.15.604 (increase in upstream elevation or significantly increase flood velocities); ARM 36.15.602(1) (excavation of material from pits or pools); ARM 36.15.603 (water diversions or changes in place of diversion);

ARM 36.15.701(3)(c) requires that roads, streets, highways and rail lines must be designed to minimize increases in flood heights.

Structures and facilities for liquid or solid waste treatment and disposal must be floodproofed to ensure that no pollutants enter flood waters and may be allowed and approved only in accordance with DEQ regulations, which include certain additional prohibitions on such disposal. ARM 36.15.701(3)(d).

Standards applied to residential, commercial or industrial structures are found at ARM 36.15.702(2).

Flood control works are subject to ARM 36.15.606, which requires compliance with safety standards for levees, floodwalls, and riprap.

ARM 36.15.901 requires electrical systems to be flood-proofed.

IV. FEDERAL AND STATE ACTION SPECIFIC REQUIREMENTS

Federal Hazardous Waste Management Regulations (Applicable)

The Resource Conservation and Recovery Act (RCRA), 42 U.S.C. əə 6901 et seq., and the Montana Hazardous Waste Act, əə 75-10-401 et seq., MCA, and regulations under these acts establish a regulatory structure for the generation, transportation, treatment, storage and disposal of hazardous wastes. These requirements are applicable to substances and actions at the site which involve the active management of hazardous wastes.

Burlington Northern operated the site and generated waste through 1986-7. Therefore, in certain instances, disposal was not pre-jurisdictional and the hazardous waste requirements are applicable now. However, DEQ does not have the documentation showing the dates of individual discharges, and therefore has, for purposes of this ROD, made a determination to treat all historic waste and media containing waste as pre-jurisdictional (in accord with the NCP and EPA guidance). Therefore, under this ROD, the historic waste which is characteristic or listed becomes hazardous upon

excavation (generation).

Identification and Listing of Hazardous Waste

Wastes may be designated as hazardous by either of two methods: listing or demonstration of a hazardous characteristic. Listed wastes are the specific types of wastes determined by EPA to be hazardous as identified in 40 CFR Part 261, Subpart D (40 CFR 261.30 - 261.33). Listed wastes are designated hazardous by virtue of their origin or source, and must be managed as hazardous wastes regardless of the concentration of hazardous constituents. Characteristic wastes are those that by virtue of concentrations of hazardous constituents demonstrate the characteristic of ignitability, corrosivity, reactivity or toxicity, as described at 40 CFR Part 261, Subpart C.

Certain of the wastes at the site demonstrate the characteristic of toxicity, and are therefore characteristic hazardous wastes upon excavation. The site also contains F001 and F002 which are listed hazardous wastes for chlorinated solvents. The various media and wastes at the site contaminated by the F001 and F002 wastes are also hazardous wastes pursuant to 40 CFR Part 261 upon excavation. The RCRA requirements specified below are applicable requirements for the treatment, storage and disposal of these wastes. See 40 CFR 261.31 (Hazardous Waste Numbers F001 and F002) and ARM 17.54.501. These ERCLs apply to remedial activities; on-going operations must comply State and federal requirements and permits.

EPA has advised EPA Regions and States that conservative, health-based levels derived from direct exposure pathways would clearly be acceptable as "contained-in" levels. [See memorandum from Sylvia K. Lowrance to Jeff Zelikson, Region IX, (January 24, 1989)]. EPA and many States specify conservative, risk-based levels calculated with standard conservative exposure assumptions (usually based on unrestricted access), or site-specific risk assessments. 61 FR at 18795 (April 29, 1996); 63 FR 28556 (May 26, 1998) [Part I of II]. For the BN Livingston Shop Complex, soils treated to below cleanup levels will be allowed to return to the site (from, for example, the electric shop) to an approved location in compliance with RCRA.

For media which contain hazardous waste, all standards are applicable except for disposal requirements for "contained-out" soils. For all non-media wastes, the standards are applicable. However, no on-site disposal of hazardous waste is allowed under the selected remedy. Therefore, all hazardous wastes, including all media not treated to cleanup levels must be disposed off-site at a regulated subtitle C facility. These standards specifically apply to free product removed from within the solvent plume. For free product removed from outside the solvent plume 40 CFR Part 279 is applicable.

Because of the presence of listed and characteristic hazardous waste, the permit requirements specified in ARM 17.53.112 are applicable. However, DEQ is exempting remedial actions involving hazardous waste from RCRA permit requirements pursuant to 75-10-721(3), MCA (1993) as long as substantive requirements are met. This does not, however, affect the requirement to comply with ARM 17.53.111, Registration and EPA Identification Numbers for Generators and Transporters.

Workplans will require detailed information on compliance with all procedural and substantive standards (as well as all ERCLs).

Set out below are the hazardous waste requirements that are applicable for the types of waste management units or the waste management practices anticipated in the remedial actions at the site.

Standards for Transporters of Hazardous Waste

The RCRA regulations at 40 CFR Part 263, establish standards that apply to transporters of hazardous waste. These standards include requirements for immediate action for hazardous waste discharges. These standards are applicable for any on-site transportation. These standards are independently applicable (see Other Laws section) for any off-site transportation.

Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

General Facility Standards

The regulations at 40 CFR 264, Subpart B, establish general facility requirements. These standards include requirements for general waste analysis, security and location standards.

Releases from Solid Waste Management Units

The regulations at 40 CFR 264, Subpart F, establish requirements for groundwater protection for RCRA-regulated solid waste management units (i.e., waste piles, surface impoundments, land treatment units, and landfills). The regulations at Subpart F establish monitoring requirements for RCRA-regulated solid waste management units (i.e., waste piles, surface impoundments, land treatment units, and landfills). Subpart F provides for three general types of groundwater monitoring: detection monitoring (40 CFR 264.98); compliance monitoring (40 CFR 264.99); and corrective action monitoring (40 CFR 264.100). Monitoring wells must be cased according to 264.97(c).

Monitoring is required during the active life of a hazardous waste management unit. If hazardous waste remains, monitoring is required for a period necessary to protect human health and the environment.

Closure and Post-Closure Monitoring and Maintenance of Waste Management or Disposal Facilities

40 CFR Part 264, Subpart G, establishes that hazardous waste management facilities must be closed in such a manner as to (a) minimize the need for further maintenance and (b) control, minimize or eliminate, to the extent necessary to protect public health and the environment, post-closure escape of hazardous wastes, hazardous constituents, leachate, contaminated runoff or hazardous waste decomposition products to the ground or surface waters or to the atmosphere.

Requirements for facilities requiring post-closure care include the following: the facilities must undertake appropriate monitoring and maintenance actions, control public access, and control post-closure use of the property to ensure that the integrity of the final cover, liner, or containment system is not disturbed. In addition, all contaminated equipment, structures and soil must be properly disposed of or decontaminated unless exempt and free liquids must be removed or solidified, the wastes stabilized, and the waste management unit covered.

Waste Containers and Tanks

40 CFR Part 264, Subparts I and J apply to owners and operators of facilities that store hazardous waste in containers, and store or treat hazardous waste in tanks, respectively. These regulations are applicable to any storage or treatment in these units at the site. The related provisions of 40 CFR 261.7, residues of hazardous waste in empty containers, are also applicable.

Waste Piles

40 CFR Part 264, Subpart L, applies to owners and operators of facilities that store or treat hazardous waste in piles. The regulations include requirements for the use of run-on and run-off control systems and collection and holding systems to prevent the release of contaminants from waste piles. These regulations are applicable to any storage in waste piles at the site.

Staging Piles

40 CFR 264.554 sets forth a new storage unit called the staging pile. A staging pile must be located within the contiguous property under the control of the owner/operator where the wastes to be managed in the staging pile originated. The staging pile must be designed so as to prevent or minimize releases of hazardous wastes and hazardous constituents into the environment, and minimize or adequately control cross-media transfer, as necessary to protect human health and the environment (for example, through the use of liners, covers, run-off/run-on controls, as appropriate). The staging pile must not operate for more than two years and cannot be used for treatment.

RCRA Land Disposal Restrictions

Since the wastes to be treated are listed and characteristic wastes, the RCRA Land Disposal Restrictions (LDRs) treatment levels set forth in 40 CFR Part 268 are applicable requirements including the treatment levels for F001 and F002 listed wastes for the disposal of hazardous wastes generated at the site. With the exception of treated soils, hazardous wastes are prohibited from disposal on-site.

The HWIR Media Rule, promulgated at 63 Fed. Reg. 65874 (November 30, 1998) allows listed waste treated to levels protective of human health and the environment to be disposed on-site without triggering land ban or minimum technology requirements for these disposal requirements. Treated soils containing hazardous waste will need to meet cleanup levels to avoid triggering land ban or minimum technology requirements for these disposal requirements.

Hazardous debris

Since on-site disposal of solid and hazardous wastes is prohibited at the site, any hazardous debris remaining on-site must comply with 40 CFR 268.45 prior to off-site disposal as a solid waste (all off-site disposal must also comply with LDR certfication requirements, which apply to these wastes). If the debris does not fully comply with 40 CFR 268.45, it must be disposed off-site at a regulated subtitle C facility.

Substantive Permit Requirements

40 CFR Part 270 sets forth the hazardous waste permit program. The substantive requirements set forth in 40 CFR Part 270, Subpart C (permit conditions), including the requirement to properly operate and maintain all facilities and systems of treatment and control are applicable requirements.

Used Oil

40 CFR Part 279 sets forth the standards for the management of used oil. For product removed from outside the solvent plume, 40 CFR Part 279 is applicable.

State Hazardous Waste Management Regulations (Applicable)

The Montana Hazardous Waste Act, ээ 75-10-401 et seq., MCA, and regulations under this act establishes a regulatory structure for the generation, transportation, treatment, storage and disposal of hazardous wastes. These requirements are applicable to substances and actions at the site which involve listed and characteristic hazardous wastes.

ARM 17.53.501-502 adopts the equivalent of RCRA regulations at 40 CFR Part 261, establishing standards for the identification and listing of hazardous wastes, including standards for recyclable materials and standards for empty containers, with certain State exceptions and additions.

ARM 17.53.601-604, adopts the equivalent to RCRA regulations at 40 CFR Part 262, establishing standards that apply to generators of hazardous waste, including standards pertaining to the accumulation of hazardous wastes, with certain State exceptions and additions.

ARM 17.53.701-708, adopts the equivalent to RCRA regulations at 40 CFR Part 263, establishing standards that apply to transporters of hazardous waste, with certain State exceptions and additions.

ARM 17.53.801-803, adopts the equivalent to RCRA regulations at 40 CFR Part 264, establishing standards that apply to hazardous waste treatment, storage and disposal facilities, with certain State exceptions and additions.

ARM 17.53.1101-1102, adopts the equivalent to RCRA regulations at 40 CFR Part 268, establishing land disposal restrictions, with certain State exceptions and additions.

Section 75-10-422 MCA prohibits the unlawful disposal of hazardous wastes.

ARM 17.53.1101-1102, adopts the equivalent to RCRA regulations at 40 CFR Part 270, which establish standards for permitted facilities, with certain State exceptions and additions.

ARM 17.53.1401, adopts the equivalent of RCRA regulations at 40 CFR Part 279 which set forth the standards for the management of used oil.

National Emission Standards for Hazardous Air Pollutants (NESHAPs)

Asbestos (Well-Suited)

The federal Clean Air Act requires the EPA to set emission standards for hazardous air pollutants. 42 USC ə 7412. Implementation and enforcement of these standards in Montana has been delegated to the State. See 40 CFR 61.04(b)(BB). Federal standards for hazardous air pollutants (NESHAPS) at 40 CFR Part 61, are incorporated by reference by ARM 17.8.341. The NESHAPS for asbestos are well-suited to the cinder pile and are discussed in the Asbestos section below; however, the solid waste requirements are the more stringent of the ERCLs that must be complied with with respect to covering of the cinder pile.

40 CFR 61.145. (well-suited). Standard for demolition and renovation. This section contains standards for demolition or renovation of a facility. The standards are designed to reduce or eliminate asbestos emissions from such operations, and include provisions for notification regarding intended project, wetting of asbestos materials, use of exhaust systems, careful movement of asbestos materials, and presence on site of a trained asbestos removal person. This section applies to any demolition or renovation of a structure, installation, building, or waste disposal area at the site containing asbestos materials.

40 CFR 61.151. (well-suited). Standard for inactive waste disposal sites for asbestos mills and manufacturing and fabricating operations. There must either be no discharge of visible emissions from the site to the outside air, or the specified covering or treatment methods must be followed. Warning signs must be posted and prior notice must be given to EPA or the State before the waste material is excavated or disturbed.

Vinyl Chloride (Applicable)

40 CFR Part 61, Subpart F contains the national emission standard for vinyl chloride. 40 CFR 61.64(b) requires concentrations from vinyl chloride in each exhaust gas stream from each stripper not exceed 10 ppm.

National Pollutant Discharge Elimination System (NPDES) and the Montana Pollutant Discharge Elimination System (MPDES)(Applicable)

40 CFR Part 122, Subpart C and ARM 17.30.1342-1344 set forth the substantive requirements applicable to all MPDES and NPDES permits. Permits must be obtained for all surface and groundwater systems that are part of remedial actions, including proper operation and maintenance of all facilities and systems of treatment and control.

Technology-Based Treatment (Applicable)

40 CFR Part 125 and ARM 17.30.1344 set forth criteria and standards for dischargers. Based on the source, the technology-based treatment standards include the best practicable control technology (BPT), best conventional pollutant control technology (BCT), or Best Available Technology Economically Achievable (BAT).

Underground Injection Control Program (Well-Suited)

The Underground Injection Control Program set forth at 40 CFR 146, sets forth the standards and criteria for the injection of substances into aquifers. Wells are classified as Class I through V, depending on the location and the type of substance injected. For all classes, no owner may construct, operate or maintain an injection well in a manner that results in the contamination of an underground source of drinking water at levels that violate MCLs or otherwise adversely affect the health of persons. Each classification may also contain further specific standards, depending on the classification.

Solid Waste Management Regulations (Applicable & Well-Suited)

ARM 17.50.505(2) specifies standards for solid waste management facilities, including the requirements that:

1. Class II landfills must confine solid waste and leachate to the disposal facility. If there is the potential for leachate migration, it must be demonstrated that leachate will only migrate to underlying formations which have no hydraulic continuity with any state waters;

2. adequate separation of group II wastes from underlying or adjacent water must be provided; and

3. no new disposal units or lateral expansions may be located in wetlands.

ARM 17.50.505 also specifies general soil and hydrogeological requirements pertaining to the location of any solid waste management facility.

ARM 17.50.511 sets forth general operational and maintenance and design requirements for solid waste facilities using landfilling methods. Specific operational requirements, specified in ARM 17.14.511 are run-on and run-off control systems requirements, requirements that sites be fenced to prevent unauthorized access, and prohibitions of point source and nonpoint source discharges which would violate Clean Water Act requirements.

ARM 17.50.530 sets forth the closure requirements for landfills. Class II landfills must meet the following criteria:

1. install a final cover that is designed to minimize infiltration and erosion.

2. design and construct the final cover system to minimize infiltration through the closed unit by the use of an infiltration layer that contains a minimum 18 inches of earthen material and has a permeability less than or equal to the permeability of any bottom liner, barrier layer, or natural subsoils or a permeability no greater than 1 X 10-5 cm/sec, whichever is less;

3. minimize erosion of the final cover by the use of a seed bed layer that contains a minimum of six inches of earthen material that is capable of sustaining native plant growth and protecting the infiltration layer from frost effects and rooting damage;

4. revegetate the final cover with native plant growth within one year of placement of the final cover.[6]

ARM 17.50.531 sets forth post closure care requirements for Class II landfills. Post closure care must be conducted for a period sufficient to protect human health and the environment. Post closure care requires maintenance of the integrity and effectiveness of any final cover, including making repairs to the cover as necessary to correct the effects of settlement, subsidence, erosion, or other events, and preventing run-on and run-off from eroding or otherwise damaging the cover and comply with the groundwater monitoring requirements found at ARM Title 17, chapter 14, subchapter 7.

[6] ARM 17.50.530(1)(b) allows the department to approve an alternative final cover design if it achieves the reduction in infiltration and protection from erosion to a level at least as equivalent as the stated criteria.

Transportation of Solid Waste (Applicable)

For solid wastes, ə 75-10-212 prohibits dumping or leaving any debris or refuse upon or within 200 yards of any highway, road, street, or alley of the State or other public property, or on privately owned property where hunting, fishing, or other recreation is permitted.

ARM 17.50.523 requires that such waste must be transported in such a manner as to prevent its discharge, dumping, spilling, or leaking from the transport vehicle.

Underground Storage Tank Regulations (Applicable)

These standards are applicable. To the extent certain UST systems were removed prior to the effective date of the regulations, diesel is found separate and distinct from an UST system, or UST regulations are not applicable, the UST requirements remain well-suited since they address situations or problems sufficiently similar to those at the site.

40 CFR Part 280, Subpart F sets forth requirements for Release Response and Corrective Action for UST Systems Containing Petroleum or Hazardous Substances. These include initial response, initial abatement measures, site characterization, free product removal, and investigations for soil and groundwater cleanup.

40 CFR 280.64 provides that where investigations in connection with leaking underground storage tanks reveal the presence of free product, owners and operators must remove free product to the maximum extent practicable as determined by the implementing agency. This regulation also requires that the free product removal be conducted in a manner that minimizes the spread of contamination into previously uncontaminated zones by using recovery and disposal techniques appropriate to the hydrogeologic conditions at the site, and that properly treats, discharges or disposes of recovery byproducts in compliance with applicable local, State and Federal regulations.

40 CFR 280.64 provides that abatement of free product migration is a minimum objective for the design of the free product removal system provides that any flammable products must be handled in a safe and competent manner to prevent fires or explosions.

40 CFR Part 280, Subpart D sets forth requirements for release detection.

40 CFR 280.43 (well-suited) specifies groundwater monitoring requirements for underground storage tanks and requires continuous monitoring devices or manual methods used to detect the presence of at least 1/8 of an inch of free product on top of the groundwater in the monitoring wells.

The Montana regulations regarding underground storage tanks include similar requirements.

Title 17, Chapter 56, Sub-Chapter 4 specifies release detection.

ARM 17.56.407 specifies groundwater monitoring requirements for underground storage tanks and requires continuous monitoring devices or manual methods used to detect the presence of at least 1/8 of an inch of free product on top of the groundwater in the monitoring wells.

Title 17, Chapter 56, Sub-Chapter 6 specifies release response and corrective action for tanks containing petroleum or hazardous substances.

A.R.M. 17.56.602 through 605 requires certain mitigation measures including removal of as much of the regulated substance from the system as is necessary to prevent further release into the environment and prevention of further migration of the released substance into surrounding soil and groundwater.

Asbestos Regulation in Building Construction and Demolition (Well-Suited)

Sections 50-64-101 et seq., MCA, regulate construction and demolition of structures that contain asbestos.

Section 50-64-104, MCA. provides for various safeguards to prevent release of asbestos into the air. The prescribed safeguards include notification of the local fire department, posting of warning signs, wetting of surfaces, dust emission control, covering and wetting during transport, and deposition at a landfill where materials are unlikely to be disturbed and where signs warn that asbestos-containing material is buried in the landfill. The listed safeguards are well-suited to the covering of the cinder pile.

Well Drilling (Applicable)

Section 85-2-505, MCA, precludes the wasting of groundwater. Any well producing waters that contaminate other waters must be plugged or capped, and wells must be constructed and maintained so as to prevent waste, contamination, or pollution of groundwater.

Section 85-2-516, MCA states that within 60 days after any well is completed a well log report must be filed by the driller with the Montana Department of Natural Resources and Conservation and the appropriate county clerk and recorder.

ARM 17.30.641 provides standards for sampling and analysis of water to determine quality.

ARM 17.30.646 requires that bioassay tolerance concentrations be determined in a specified manner.

ARM 36.21.670-678 and 810 specifies certain requirements that must be fulfilled when abandoning monitoring wells.

Reclamation Requirements (Well-Suited)

Certain portions of the Montana Strip and Underground Mining Reclamation Act and Montana Metal Mining Act are well-suited requirements for certain revegetation and construction activities at the site.

Section 82-4-231, MCA: Requires operators to reclaim and revegetate affected lands using most modern technology available.

Section 82-4-233, MCA: Operators must plant vegetation that will yield a diverse, effective, and permanent vegetative cover of the same seasonal variety native to the area and capable of self-regeneration.

Section 82-4-336, MCA: Disturbed areas must be reclaimed to utility and stability comparable to areas adjacent.

ARM 17.24.501: Provides general backfilling and grading requirements.

ARM 17.24.519: Pertinent areas where excavation will occur will be regraded to minimize settlement.

ARM 17.24.631: Disturbances to the prevailing hydrologic balance will be minimized. Changes in water quality and quantity, in the depth to groundwater and in the location of surface water drainage channels will be minimized, to the extent consistent with the selected response alternatives. Other pollution minimization devices must be used if appropriate, including stabilizing disturbed areas through land shaping, diverting runoff, planting quickly germinating and growing stands of temporary vegetation, mulching, and control of toxic-forming waste materials.

ARM 17.24.633: Surface drainage from a disturbed area must be treated by the best technology currently available (BTCA). Treatment must continue until the area is stabilized.

ARM 17.24.634: Disturbed drainages will be restored to the approximate pre-disturbance configuration, to the extent consistent with the selected response alternatives.

ARM 17.24.638: Sediment control measures must be implemented during operations.

ARM 17.24.639: Sets forth requirements for construction and maintenance of sedimentation ponds.

ARM 17.24.640: Discharges from sedimentation ponds, permanent and temporary impoundments, must be controlled to reduce erosion and enlargement of stream channels, and to minimize disturbance of the hydrologic balance.

ARM 17.24.643 through 17.24.646: Provisions for groundwater protection, groundwater recharge protection, and groundwater and surface water monitoring.

ARM 17.24.701 and 702: Requirements for redistributing and stockpiling of soil for reclamation. Also outline practices to prevent compaction, slippage, erosion, and deterioration of biological properties of soil will be employed.

ARM 17.24.711: Requires that a diverse, effective and permanent vegetative cover of the same seasonal variety and utility as the vegetation native to the area of land to be affected must be established. This provision would not be well-suited in certain instances, for example, where there is dedicated development.

ARM 17.24.713: Seeding and planting of disturbed areas must be conducted during the first appropriate period for favorable planting after final seedbed.

ARM 17.24.714: Mulch or cover crop or both must be used until adequate permanent cover can be established.

ARM 17.24.716: Establishes method of revegetation.

ARM 17.24.718: Requires soil amendments, irrigation, management, fencing, or other measures, if necessary to establish a diverse and permanent vegetative cover.

ARM 17.24.723: States that operators shall conduct approved periodic measurements of vegetation, soils, and water.

ARM 17.24.724: Specifies that revegetation success must be measured by approved unmined reference areas. Required management for these reference areas is set forth.

ARM 17.24.726: Sets the required methods for measuring productivity.

ARM 17.24.728: Sets requirements for measurements of the composition of vegetation on reclaimed areas.

ARM 17.24.761: This specifies fugitive dust control measures which will be employed during excavation and construction activities to minimize the emission of fugitive dust.

Noxious Weeds (Applicable)

§ 7-22-2101(7)(a), MCA defines "noxious weeds" as any exotic plant species established or that may be introduced in the state which may render land unfit for agriculture, forestry, livestock, wildlife, or other beneficial uses or that may harm native plant communities and that is

designated: (i) as a statewide noxious weed by rule of the department; or (ii) as a district noxious weed by a board, following public notice of intent and a public hearing. Designated noxious weeds are listed in ARM 4.5.201 through 4.5.204 and must be managed consistent with weed management criteria developed under MCA § 7-22-2109(2)(b). Notification and plan must occur as set forth in § 7-22-2152, MCA, as amended.

V. OTHER LAWS

These laws are laws which are independently applicable rather than ERCLs for the site.

Surface Water and Groundwater Act

Section 85-2-101, MCA, declares that all waters within the state are the state's property, and may be appropriated for beneficial uses. The wise use of water resources is encouraged for the maximum benefit to the people and with minimum degradation of natural aquatic ecosystems.

Groundwater and Surface Water Appropriation

Parts 3 and 4 of Title 85, Chapter 2, MCA, set out requirements for obtaining water rights and appropriating and utilizing water. All requirements of these parts are laws which must be complied with in any action using or affecting waters of the state.

Controlled Ground Water Area

Pursuant to section 85-2-507 MCA, the Department of Natural Resources and Conservation may grant either a permanent or a temporary controlled ground water area. The maximum allowable time for a temporary area is four years.[7]

Pursuant to 85-2-506 MCA, designation of a controlled groundwater area may be proposed if (a) that ground water withdrawals are in excess of recharge to the aquifer or aquifers within the ground water area; (b) that excessive ground water withdrawals are very likely to occur in the near future because of consistent and significant increases in withdrawals from within the ground water area; (c) that significant disputes regarding priority of rights, amounts of ground water in use by appropriators, or priority of type of use are in progress within the ground water area; (d) that ground water levels or pressures in the area in question are declining or have declined excessively; (e) that excessive ground water withdrawals would cause contaminant migration; (f) that ground water withdrawals adversely affecting ground water quality within the ground water area are occurring or are likely to occur; or (g) that water quality within the ground water area is not suited for a specific beneficial use defined by 85-2-102(2)(a).

[7] If a temporary controlled ground water area is granted, the statute requires DNRC to commence studies to determine the designation or modification of a permanent controlled ground water area.

Occupational Safety and Health Act

The federal Occupational Safety and Health Act regulations found at 29 CFR 1910 are applicable to worker protection during conduct of RI/FS or remedial activities.

Montana Occupational Health Act

ARM ə 17.74.101, along with the similar federal standard in 29 CFR 1910.95, addresses occupational noise.

ARM ə 17.74.102, along with the similar federal standard in 29 CFR 1910.1000 addresses occupational air contaminants.

Montana Safety Act

Sections 50-71-201, 202 and 203, MCA, state that every employer must provide and maintain a safe place of employment, provide and require use of safety devices and safeguards, and ensure that operations and processes are reasonably adequate to render the place of employment safe.

Employee and Community Hazardous Chemical Information Act

Sections 50-78-201, 202, and 204, MCA, state that each employer must post notice of employee rights, maintain at the work place a list of chemical names of each chemical in the work place, and indicate the work area where the chemical is stored or used. Employees must be informed of the chemicals at the work place and trained in the proper handling of the chemicals.

Standards for Generators of Hazardous Waste

The RCRA regulations at 40 CFR Part 262 and ARM 17.53.601-604 establish standards that apply to generators of hazardous waste. These standards include requirements for obtaining an EPA identification number and maintaining certain records and filing certain reports. These standards are applicable for any waste which will transported off-site.

Standards for Transporters of Hazardous Waste

The RCRA regulations at 40 CFR Part 263 and ARM 17.53.701-708 establish standards that apply to transporters of hazardous waste. These standards include requirements for immediate action for hazardous waste discharges. These standards are applicable for any off-site transportation.

RCRA Land Disposal Restrictions

Since the wastes to be treated are listed and characteristic wastes, the RCRA Land Disposal Restrictions (LDRs) treatment levels set forth in 40 CFR Part 268 ARM 17.53.1101-1102 are applicable requirements including the treatment levels for F001 and F002 listed wastes for the disposal of hazardous wastes generated at the site.

Oil Transportation

49 CFR Chapter I, Subchapter B (Oil Transportation) and Subchapter C (Hazardous Materials) and ARM. 23.5.101apply to transporters of oil and hazardous materials. These standards are applicable for any off-site transportation of oil meeting the quantity requirements set forth in Subchapter B or for the transportation of hazardous materials such as the transportation of asbestos-containing waste material.

Montana Asbestos Control Act

The Montana Asbestos Control Act, ээ 75-2-501 et seq., MCA, and implementing rules establish standards and procedures for accreditation of asbestos-related occupations and control of the work performed by persons in asbestos-related occupations.

A permit from DEQ is required before any person can conduct an asbestos project. The definition of "asbestos project" includes the encapsulation, enclosure, removal, transportation, or disposal of asbestos-containing waste. э 75-2-502(4), MCA; ARM 17.74.302(3). In addition, a person who inspects, plans, designs, supervises, contracts for or works on an asbestos project must meet DEQ training and accreditation requirements. see also э 75-2-511, MCA.

ARM 17.74.314 states that no person may engage in an asbestos-type occupation unless accredited in that occupation or may employ or subcontract with nonaccredited individuals or contractors. No person may conduct an asbestos abatement project without a permit.

ARM 17.74.335 states that asbestos abatement projects require a DEQ permit. The permit conditions include but are not limited to:

a. a requirement that all work performed be in accordance with 29 CFR 1926.58 (asbestos standards for the construction industry); and 40 CFR 763.120, 121 (requirements for asbestos abatement projects);

b. a requirement that all asbestos be properly disposed in an approved asbestos disposal facility. "Approved asbestos disposal facility" is defined at ARM 17.54.302(1) as a properly operated and licensed class II landfill as described in ARM 17.50.504;

c. a requirement that asbestos be disposed in accordance with 40 CFR Part 61, Subpart M

(National Emission Standard for Asbestos). See discussion above on National Emission Standard for Asbestos.

ARM 17.74.338 requires an accredited asbestos abatement supervisor be physically present at all times at the work-site where a permitted asbestos abatement project is being performed and must be accessible to all workers. On-site air monitoring must be conducted by an accredited asbestos contractor/supervisor, an engineer or industrial hygienist.

ARM 17.74.341 requires records of each asbestos abatement project be retained for a minimum of 30 years and must be made available to DEQ at any reasonable time. This section provides a non-inclusive list of the records to be retained.

Locomotive Emissions

40 CFR Part 92 establishes control of air pollution from locomotives and locomotive engines.

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Appendix B

Response Summary

Burlington Northern Livingston Shop Complex

Livingston, Montana

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1.0 INTRODUCTION

The Montana Department of Environmental Quality (DEQ) released a Proposed Plan describing the State's preferred final remedy at a public meeting on September 22, 1998 in Livingston. A public comment period was held from September 22, 1998 through November 23, 1998. On October 23, 1998 a public hearing was held in Livingston to accept oral comments on the Proposed Plan and feasibility studies (FSs). DEQ received oral comments from nine people at the public hearing. DEQ also received written comments from nine individuals or organizations during the public comment period, several of whom had also submitted oral comments; one of these comments was received after the public comment period ended, but DEQ considered and responded to this comment. All comments received are contained in DEQ's Administrative Record.

1.1 Community Involvement Background

DEQ has conducted community involvement activities for the BN Livingston Shop Complex (sometimes referred to as the site) in accordance with state and federal laws and U.S. Environmental Protection Agency (EPA) guidance. DEQ strongly believes citizens of Montana, especially residents living near Superfund sites who will be most affected by agency decisions, should have the opportunity to be actively involved in the decision making process. DEQ has made every effort to involve the community, including local officials and residents, in all aspects of the investigation and cleanup.

1.1.1 Notification of Public Comment Period

Press releases were sent to newspapers and radio stations to announce public comment periods for the remedial investigation (RI), FSs and Proposed Plan. Public meetings were also announced in local newspapers and occasionally on the local radio station. Printed notices were large (at least 4 inches by 5 inches in size) and published in the Livingston Enterprise, a daily newspaper. Many of the meetings were also advertised in the Bozeman Chronicle and Billings Gazette.

1.1.2. Administrative Record

The Administrative Record is the set of documents upon which the selected remedy is based. The Administrative Record is required under section 113(k) of CERCLA and section 75-10-713, MCA, of CECRA. The complete Administrative Record, including all documents related to the site, is available for public review at the DEQ in Helena. A partial Administrative Record, including major documents related to the site, is available for public review at the Park County Public Library in Livingston.

1.1.3 Document Repositories

DEQ maintains document repositories at the following sites:

DEQ
Remediation Division
Hazardous Waste Site Cleanup Bureau
2209 Phoenix Avenue
Helena, MT 59620-0901
Telephone: (406) 444-1420
(Complete AR)

Park County Public Library
228 West Callender
Livingston, MT 59047
Telephone: (406) 222-0862
(Partial AR)

Repositories for major documents are at:

Montana State Library, Capitol Complex, Helena, MT 59620
Montana State University, Renne Library, Bozeman, MT 59715
University of Montana, Mansfield Library, Missoula, MT 59801

1.1.4 Citizens Groups

In November 1989, DEQ's project coordinator for the BN Livingston Shop Complex site began meeting with the Livingston Informed Friends of the Environment (LIFE) group in Livingston. LIFE was organized early on during the project and appointed by the Livingston city council to monitor the site and ensure citizens of Livingston that the State was providing adequate oversight and protecting public health and the environment. The DEQ project coordinator met regularly with the LIFE group to explain site-related issues, review project work plans and answer technical questions about the cleanup. Early in the project DEQ conducted site tours for LIFE and other concerned citizens. In June 1992 the LIFE group disbanded.

In April 1995 Park County Environmental Council (PCEC) obtained a $50,000 EPA technical assistance grant to continue monitoring cleanup progress at the site. DEQ will continue to work with PCEC on technical issues related to the BN Livingston Shop Complex. DEQ will provide PCEC copies of all future draft and final work and design plans, schedules, and reports. DEQ will consider any information and comments PCEC provides prior to approving documents.

1.1.5 Progress Reports

To keep citizens updated about site activities, DEQ published regular progress reports from 1989 through 1992. These reports contained information on recently released documents, upcoming meetings, completion of projects, sampling results and other information. Progress reports were sent to individuals on the mailing list for the site, local newspapers and local radio stations. Progress reports will resume during remedial action.

1.1.6 Toll-free Hotline

DEQ maintains an in-state toll-free number (1-800-246-8198) for people who want to contact DEQ about the BN Livingston Shop Complex or other Superfund sites. DEQ Remediation Division staff direct calls to appropriate state project officers. The toll-free number is answered in person during business hours. In addition, DEQ maintains a website.

1.1.7 Mailing List

DEQ maintains a private mailing list that is periodically updated. DEQ has actively solicited additions to the mailing list in progress reports and at public meetings. In accordance with state law, the mailing list is generally not released to the public.

1.2 Chronology of Community Relations Activities

In the fall of 1988, DEQ personnel toured the site, met with local officials and conducted interviews with community residents. In May 1989 the Governor and the DEQ director visited the site, met with community leaders and conducted a public meeting. On June 22, 1989 another meeting was held to discuss private groundwater wells. On December 1, 1989, DEQ and BNSF held a public negotiating session about revisions to the Draft Partial Consent Decree. On December 7, 1989, DEQ held a public meeting to discuss revisions to the consent decree. A total of four public meetings and one public hearing were held in 1989. In 1991 DEQ published the Community Involvement Plan (DEQ, June 1991) to summarize community concerns and outline ways to address those concerns.

Many other public meetings have been held in Livingston to update the public about interim actions, describe health studies performed by the Agency for Toxic Substances and Disease Registry (ATSDR) and DEQ and discuss technical documents. Some of the meeting topics and dates were:

a) Public Health Assessment by DEQ and the Agency for Toxic Substances and Disease Registry (ATSDR) on February 26, 1997,

b) Presentation of findings from the basement gas study on May 13, 1993,

c) Presentation of the Baseline Risk Assessment (BRA) and discussion about which homes are eligible for basement gas sampling on October 14, 1992,

d) Public Hearing to present the Montana Pollutant Discharge Elimination System (MPDES) permit to treat contaminated water generated during interim and cleanup activities on November 15, 1991,

e) RI presentation on November 6, 1991,

f) Public site tour held on October 26, 1991,

g) Public meeting to discuss ATSDR health studies on October 4, 1990, and

h) Public meeting to discuss testing two methods to remove diesel fuel from the groundwater on April 30, 1990.

1.3 Explanation of Response Summary

All comments received, including those provided to DEQ after the comment period, have been reviewed and considered by DEQ in the decision making process and are addressed in this Response Summary. To assist in developing responses, DEQ added its own numbering to each comment. Each specific oral and written comment is stated verbatim. In order to avoid duplication of some responses, similar comments are usually addressed only once for the first occurrence of the comment and thereafter referenced to the appropriate response. Written comments and the public hearing transcript are part of the Administrative Record.

2.0 RESPONSES TO ORAL COMMENTS

2.1 Comments from Mr. Mike Doyle

Comment 1: Okay. My name is Mike Doyle, and I'm here as Mike Doyle. I'm a city commissioner, but I'm speaking on my own this evening. And I want to thank the State for its efforts in helping to take care of the situation here in Livingston. I want to thank the BN as well. As I hope that together with the city of Livingston, we can all work together in harmony and in trying to alleviate the problems that are here. There's three items I'd like to address, and that's prior to enacting the final solution or the chosen remedy, there are three areas that are potential health hazards for us, and I'd like to see something done about it while negotiating is going on with the BN and the State concerning some tougher issues, that being the diesel plume and how it's going to be removed. Number one is to fence and sign the cinder pile to prevent public access to the pile, which contains asbestos. Second is to remove and dispose of the treated contaminated soils under the old electric shop and the man way pit over there at the site. And thirdly, institute, reinstitute a basement gas sampling program in the private ground that is over there. In conclusion, I'd like to say that local representation should be a part of the discussions concerning the final consent decree with BN and with the State. That's all I have to say. Thank you very much.

Response 1:

Continued Interim Actions and Basement Gas Sampling - On July 1, 1999 DEQ approved BNSF's "Electric Shop Soil Excavation Final Work Plan Livingston Rail Yard" (dated June 28, 1999) to remove and treat contaminated soils from under the electric shop and transfer pit manways**.** The contaminated electric shop soils are currently being treated onsite with an ex-situ soil vapor extraction system. DEQ will also evaluate confirmation sampling results to determine if cleanup levels were achieved during the interim action for the areas covered by the plan. If not, DEQ will require remaining contaminated soils be treated by soil vapor extraction until cleanup levels are achieved. On December 16, 1998, the cinder pile was temporarily fenced,

which limited access. The Record of Decision (ROD) requires fencing, capping, and deed restrictions for remediation of the pile. As part of the final remedy, additional basement gas sampling will be conducted in several homes that previously had the highest levels of volatile organic compounds (VOCs). An approved work plan will incorporate new sampling methodologies for basement gas, which should provide better data. If sampling results indicate exceedances of EPA Region IX preliminary remediation goals for ambient air, then sampling will be expanded as appropriate and site-specific cleanup levels will be calculated for indoor air and, if necessary, appropriate mitigation measures will be implemented. It is not DEQ's intention to require this as an interim action.

Public Participation in Negotiations - DEQ confirms in Section 1.2, Chronology of Community Relations Activities that the original modified partial consent decree was the subject of four public meetings and a public hearing in 1989. The ROD is final and will not be subject to negotiations. It is DEQ's intent to waive confidentiality for the draft consent decree and scope of work given to BNSF as part of the special notice procedure. However, after that point, DEQ will maintain confidentiality during the consent decree negotiations with BNSF in order to better facilitate good faith negotiations. Should consent decree negotiations prove successful, section 75-10-713, MCA, provides for a thirty-day public comment period for a consent decree prior to its approval. In addition, the public will have the opportunity to review and comment on the scope of work that will be attached to the consent decree, and work plans and schedules that will be submitted during and after consent decree negotiations.

2.2 Comments from Steve Golnar, Livingston City Manager

Comment 2: I'd like to submit my testimony as written. I think that would be better than me reading the whole deal, and I've given that to her. Well, this is oral testimony. I understand we had the oral comments tonight. This is as far as the city has gotten in its thought process on this. And we'll be looking at possibly revising it in preparation for the final written comment period of November 22nd. Thank you.

Response 2: DEQ received final combined written comments from the city of Livingston and Park County and responds to them in Section 3.

Comments from Dave Cook, representing Montana Rail Link (MRL)

Comment 3: I'm representing Montana Rail Link for this public comment period, and we will be following up also with documentation and a written comment, also. MRL desires to continue its commitment to being environmentally pro-active and sensitive. As seen in this MDEQ manual, we appreciate the efforts of the State to putting together such a concise report.

We do have some health and safety concerns, though. MRL believes that we can have a railroad that operates without hurting people. We have undertaken a dramatic change in our safety culture with Montana Rail Link. I'd like to offer you some information. We have what we call a "casualty index ratio," which describes the amount of hours worked times 200,000 and divided by the men that have worked. And we have done remarkable reduction in our injuries on our

railroad. Starting in 1989, we had a casualty index ratio of 13.76, and it's steadily decreased every year until 1997 where we were 3.46. And as of today in 1998, we're 0.89.

During our safety meetings and safety audits that we have on our railroad, our people have consistently brought up our responsibility in reducing tripping hazards as well as reducing outside contractors' activity in and amongst our property. This proposal has more than 40 proposed wells to be considered in and amongst our rail yard. We have many physical obstacles such as electrical, gas, underground sanitary, underground industrial piping, signal wires for the communications department, communications such as telephone, and a contractor of Sprint throughout our rail complex. More importantly, our concerns are with the safety after construction during the collection process as presented in the addendum here, as outlined in this proposal.

And on an operating side, in 1995, within the company of Montana Rail Link we had 58 injuries of which 24 were in yard limits. In 1996, we had 68 injuries of which 22 were in yards. In 1997, we had 40 injuries, 21 of which were in yard limits. And in 1998, we've had 10, 4 of which have been in yard limits. So I hope you can see our concerns with any obstructions or activities amongst our yards.

In rail yards, all crafts such as operating, mechanical, Maintenance of Way are actively working amongst randomly moving trains, engines and free-moving cars. Movement can be made at any direction, at any time, in a tight working environment. Tracks are as close as 13 and a half feet from each other, center to center, which leaves only three and a half to four feet between cars on adjacent tracks.

Our employees work under company and federal regulations to ensure their safety. These rules are complex, and outside contractors are required to be accompanied by a Montana Rail Link flagman, which is certified on these work rules. We feel that our people would be subjected to unnecessary obstacles, such as in the wells and other additional activities to be concerned with, such as contractors in amongst the yard. Because of the uncertainty of the success of the fuel recovery portion of this proposal, we ask that the Phase I remain outside of tracks 1 through 14. We have 119 employees working and living in the community of Livingston. Help us keep those folks safe. Thank you.

Response 3:

Worker Safety - Worker health and safety concerns are of critical importance, as a large portion of the Livingston Shop Complex remains an active facility.

DEQ notes that MRL was awarded the 1998 Harriman Safety Award for Class C railroads. DEQ has considered the ongoing operation of MRL and Talgo-LRC, including health and safety issues, when formulating the phased diesel fuel recovery plan specified in the ROD. Similar to constructing freeways and highways, construction activities within an active rail yard must be performed with the highest concern for worker safety and protection. Using planning, coordination, train-spotters, radio communication and daily safety meetings will ensure the installation, maintenance and operation of the diesel fuel recovery system can occur safely.

To reduce worker risk during construction and operation and maintenance of Phase I free-product diesel recovery, recovery wells will be installed in areas of the railyard with reduced or no train traffic. Seventy percent of the recovery wells will be located in areas of the railyard where worker exposure and risk to train traffic is lowest. Sixteen diesel fuel recovery wells (36%) will be installed in the Park Street right-of-way where there is no train traffic. Fifteen recovery wells (34%) will be installed along abandoned track 4 where the working distance between active siding tracks is doubled (from 13.5 feet to 27.0 feet) and should provide adequate working space to safely install the recovery system. DEQ is confident the remaining 30% of Phase I diesel fuel recovery wells can be safely installed and operated while effectively recovering diesel fuel using similar methods that were employed during the construction and operation of Test Cell 4, as described below. In addition, some of these wells will be installed in the MRL tunnel area. If the MRL tunnel area is utilized during free product recovery, there will be less of a need to be in the active railyard. DEQ will also consider the ongoing operation of MRL and Talgo-LRC, including health and safety issues in the design and implementation of Phase II free-product diesel recovery.

Envirocon demonstrated that injuries to workers can be avoided during the installation of Test Cell 4. This system was installed and operated in summer and winter of 1991. By carefully coordinating work activities with MRL's Missoula and Livingston dispatchers, utilizing train-spotters and radio communications and holding daily safety meetings, Envirocon, Inc. (MRL's sister company) demonstrated that a multiple-well pilot-test diesel recovery system, (Test Cell 4), could be successfully constructed within active train tracks without worker injury. From approximately July 24, 1991 through September 24, 1991 Envirocon installed Test Cell 4. Test Cell 4 was a complex engineering project requiring close cooperation between MRL, LRC and Envirocon. It was constructed over a two-month period using rolling construction equipment, drill rigs and many workers. Large culverts and concrete vaults were installed between tracks and utility lines were buried parallel to and under tracks. The system was operated and maintained by Envirocon workers from September 24, 1991 through November 22, 1991 and December 18, 1991 through January 18, 1992. This system did not operate after January 18, 1992 because of biofouling problems with the reinjection wells.

DEQ understands tripping hazards within active railyards are an important concern. During installation and construction of Test Cell 4, man ways to contain recovery equipment and utilities, such as electricity, water lines, product (diesel fuel) recovery lines, air lines and other necessary equipment, were flush mounted or buried to prevent trip hazards. DEQ will require Phase I and II incorporate similar techniques.

One of the reasons DEQ dedicated Phase I recovery wells along track 4 is because the south portion of Test Cell 4 is located there and, with very little modification, existing man ways and utility lines can be extended and utilized for Phase I recovery wells. Utilizing existing automated Test Cell 4 recovery equipment and utility lines would reduce the amount of time workers spend installing wells within track 4 area and would also reduce the amount of time workers spend within track 4 during operation and maintenance efforts. In addition, DEQ also located Phase I recovery wells in the tunnel. DEQ believes workers can safely conduct recovery efforts within the tunnel, thereby limiting the amount of time workers would spend in the railyard during operation and maintenance of Phase I.

DEQ understands operating, mechanical and maintenance-of-way craft personnel work within active rail road tracks under strict safety controls with few injuries. DEQ will require BNSF and its contractor, Envirocon, Inc., to coordinate with MRL and Talgo-LRC to identify safety protocols MRL and Talgo-LRC use to protect workers while working amongst active rail tracks. A specific safety workplan for active operations will be prepared as part of the remedial design. DEQ will require construction personnel installing and operating the diesel recovery system to follow the same strict safety rules and training that railyard workers follow.

Comments from Art Middlestadt

Comment 4: My name is Art Middlestadt. I'm currently a resident of Cheyenne, Wyoming. However, I'm a landowner in Montana and a past resident and future resident also, God willing. And I've been working in the groundwater remediation business for a long time, both here and Wyoming. I worked with the Montana Bureau of Mines for about eight years, and then we moved down to Wyoming to start up an office down there.

But my concern is the expense and the lack, or at least the potential lack, of result on picking up the contaminants that you have here. In my experience -- and it's just my own personal experience -- vapor extraction systems and bioventing systems and air sparging do not work well in diesel because it's a heavier hydrocarbon. It works well in gasolines. This way they can volatilize easily, but diesel, especially on a shallow groundwater table, tends to go down, and I guess you'd call it, attach itself or it works right on the groundwater level working with a floating groundwater.

And the technology we found works well and is basically being accepted world-wide now is using a, I can't think of the name. I'm getting tongue-tied here. Surfactant, enhanced aquifer remediation. What it does, the surfactant will go down and break the bond between the groundwater and the hydrocarbons that are both above and below the groundwater level. And in doing so, it releases that bond, and then it also encapsulates the hydrocarbons so they don't reattach and reform this bond with changing water levels. And you can either flush them out or actually you can extract them with a vacuum setup with the wells that you have, I understand, in place already. You actually flush the surfactant down and then suck it back up, and in other studies we've had -- I do quite a bit of work with the military -- we've had as high as 99 percent recovery of spills and stuff that have gone down and actually attached themselves in the soil.

And I feel that with all the work that we have done, I have put in probably oh, 30 or 40 of these soil vapor extraction systems and air sparging systems, and on diesel, they're very ineffective. You get a very minimal amount of recovery or -- if you can break that bond first, I think it's a better deal.

And again, I want to be back here in Montana. I want to see the public money used the best way it can be. And if you can do something for a million dollars instead of 10 million dollars, it makes sense to do it or at least to look at it. That's all I have.

Response 4:

Surfactants as a Cleanup Alternative - The Proposed Plan and ROD does not set forth vapor extraction, bioventing and air sparging as technologies evaluated in Phase I to remove diesel fuel from groundwater. Passive recovery of diesel fuel from groundwater using belts, pumps, canisters or other efficient technologies will be used to remove diesel fuel until 1/8 inch or less of free product remains throughout the plume. Subsequently, bioventing will be employed to enhance biodegradation of residual diesel fuel adsorbed to soil. Bioventing will not volitize and remove the heavier end diesel fuel directly. Air sparging is not proposed to remove or recover diesel fuel from groundwater or soil.

DEQ (and BNSF) listened to a presentation by Mr. Middlestadt for the surfactant chemical. The use of surfactants to recover diesel fuel was eliminated early in the preliminary technology evaluation of the feasibility study process because of the delivery problem. The biggest challenge of adding sufactants to an aquifer and vadose zone is delivering and dispersing the material in the aquifer and subsurface soil. To deliver and disperse a surfactant at the BN Livingston Shop Complex, DEQ has calculated delivery wells would need to be installed on 20-foot centers, which would significantly add to the cost without tangible benefit. DEQ does not believe there is enough data to demonstrate that surfactants should replace or be added to the selected remedy.

All cleanup options presented in the FS were evaluated using the CECRA criteria, including cost effectiveness. CECRA requires costs be borne by potentially liable persons rather than public funds. As set forth in the consent decree, DEQ will enter into good faith negotiations with BNSF to implement the selected remedy. If negotiations are not successful, DEQ will order the remedy to be implemented. Neither of these options requires the public to bear the costs.

2.5 Comments from Rebecca Weed, representing Park County Environmental Council (PCEC)

Comment 5: Rebecca Weed. 13,000 Springhill Road, Belgrade, Montana. I work with RTI, the technical advisor to PCEC. I just have a couple of brief remarks. First of all, I'd like to reiterate the emphasis that I think that interim actions on a few items which BN and the State can agree on could be very important and useful and shouldn't be delayed by the other issues, which are under dispute.

Secondly, I'm somewhat concerned that there are members of the public who still aren't clear that even if a remediation is carried out, there's still going to be residual diesel products. And I don't want there to be a rude awakening a few years down the road when people realize that, basically, we won't be able to remove all of the free product. That's just a general comment. It doesn't have any bearing on the actual feasibility study document.

And the principal item of dispute between the State and BN involves what should be done to clean up the free product, and it hinges on two real issues. One is the disagreement about what's the thickness of the remaining product? And two, what's the actual hazard to workers if there are going to be wells drilled in the center of the plume?

And I think that it might be possible to clarify -- some of that dispute, there are still some remaining holes in the data and the latest groundwater sampling report by BN regarding the thickness of the remaining plume. And I think that PCEC -- the Park County Environmental Council -- we want to repeat our concern that as much be done as possible, but that we recognize there may be technical limitations to what can be done, and if, in fact, the free product is thin enough that we can't practically recover it, we're willing to recognize that right now, there's disagreement about what the thickness of that product is.

Response 5:

Please refer to Response #1 regarding continued interim actions and Response #3 regarding worker safety.

Free Product Recovery - Free product or mobile non-aqueous phase liquid (NAPL) recovery to the "maximum extent practicable" is a federal mandate specified in the Resource Conversation and Recovery Act (RCRA) Subtitle C (Underground Storage Tank regulations). The application of that law to this site is both appropriate and consistent with DEQ's requirements at other diesel fuel release sites in Montana. A large amount of recoverable diesel fuel is present at the site and meets criteria for "active free product recovery" specified in the September 1996, EPA Publication, "How to Effectively Recover Free Product at Leaking Underground Storage Tank Sites." These criteria, specified on page II-9 and II-10, are as follows:

> "Factors which suggest a need for free product recovery include:
>
> - Estimates of free product at the water table that are moderate to high (greater than 200 gallons)
> - Permeable aquifer (e.g., sands and gravels) or hydraulic conductivity greater than 10^{-3}cm/sec.
> - Thick accumulations of free product in wells (greater than 1.0 foot).
> - Nearby surface water or groundwater use (e.g., close proximity to receptors)…"

The main free product plume area at the BN Livingston Shop Complex site meets at least three of the four criteria for consideration of free product recovery.

DEQ agrees it is important for the public to understand that reasonable environmental industry standards project 20% to 50% diesel fuel recovery rates based on soil type and weathering. DEQ advocates taking an active approach to free product recovery by implementing free product (or NAPL) recovery techniques commonly used in the environmental remediation industry. These techniques often recover up to 50% of the available diesel free product at cleanup projects. Although diesel fuel recovery will not remove 100% of the free product, DEQ considers it is important to remove as much free product from above the groundwater and saturated zone as possible to allow air to flow through soil pore spaces. Allowing air and oxygen into soil spaces, which previously contained diesel fuel, will enhance biodegradation of the remaining residual NAPL once bioventing is employed. Utilizing bioventing without free product recovery will significantly extend the time it takes to cleanup diesel fuel. The selected remedy requires

removal of all the diesel fuel to cleanup levels. The unrecoverable diesel will need to be destroyed by natural microbial processes over several decades. The time to achieve cleanup levels is drastically reduced by removing as much of the free product as practicable during the early phases of this project. For more discussion of biodegradation versus free product recovery, see Response #7.

"Intuitively, the most effective locations for free product recovery devices are those places where the accumulations are the greatest." *How to Effectively Recover Free Product At Leaking Underground Storage Tank Sites: A Guide for State Regulators.* (EPA 510-R-96-001). September 1996. P. IV-1. Phase I allows DEQ to seek the most cost-effective way to meet protection of human health and the environment and comply with environmental requirements, criteria and limitations (ERCLs) while providing minimum impact to on-going operations.

The difference in BNSF's and DEQ's interpretations of existing apparent hydrocarbon thickness seems insignificant when compared with the lack of available data in large areas of the plume. One important objective of the Phase I recovery system is to obtain additional free product thickness data, especially in the center of the diesel plume, to fill those gaps. Product thickness data interpretation will help define areas in which free product recovery is practical. The thickness of a free product layer in a well is a function of well construction, hydrocarbon saturation and other factors. During Phase I hydrocarbon recovery, DEQ intends to optimize well construction and place wells in areas where recoverable amounts of free product exist.

The issue of product thickness will affect the remedy during design and evaluation of Phases I and II. DEQ has relied on Envirocon's free product thickness data for estimated thicknesses of diesel fuel. It is important to note that contour lines on Figure 3.0 in the Final Draft Hydrocarbon FS Report are based on product thickness information from wells surrounding the center of the plume. DEQ expects product thicknesses in this area to be reasonably accurate. However, data indicates that free product is somewhat discontinuous along Park Street. Some previous feasibility tests conducted to determine free product recovery rates (especially Test Cells 3 and 4) required significant draw down of the water tables, and contributed to "smearing" free product vertically into lower parts of the aquifer in these test areas. It is thought that once the water table recovers to its pre-draw down conditions, smeared free product may remain trapped within the aquifer media below the water table. If this has happened this trapped free product would not readily flow into monitoring wells where it can be measured. This may account for the discontinuous nature of free product measured in monitoring wells along Park Street.

There is a regulatory obligation to remove free product to the maximum extent practicable. Complete recovery should not be expected and is not practical at any hydrocarbon recovery site. The ROD requires that the performance of the Phase I recovery system will be evaluated after two to three years of operation. At that time the recovery system will be evaluated with the objective of optimizing recovery rates site-wide. This evaluation will help determine how to proceed with future recovery efforts.

Many free product systems can remove up to 0.01 foot or less (EPA, September 1996). However, DEQ recognizes that the success of free product recovery may be based on many different variables. DEQ's experience at numerous leaking underground storage tank sites in

Montana is that the design and installation of a free product recovery system is a critical factor in successfully removing free product from the water table. With the proper design and system installation, DEQ believes a considerable amount of free product can be recovered and cleanup standards met.

DEQ recognizes that it is not technically feasible to recover 100% of the product at this site or at any petroleum release site. However, removal is required to the maximum extent practicable. DEQ representatives have discussed this fact at previous public meetings for the BNSF Livingston Shop Complex. Existing monitoring wells at the site indicate it is appropriate to implement free product recovery at this time.

2.6 Comments from Robin Billau, representing Park County Environmental Council

Comment 6: I live at 174 Quinn Creek Road, Bozeman. I'm representing Park County Environmental Council, and the comments that I want to make on the proposed plan is, first of all, PCEC generically agrees with the State's proposed plan for both the soil and the groundwater and the diesel fuel. We are concerned about the timing, though, and we would like to request that the State consider interim actions that would occur prior to the Record of Decision being finalized.

Just as Mike Doyle iterated before, we believe that there are several items that are going -- that are most protective of the public that need to be done as soon as possible. First of all is to fence and sign the cinder pile to prevent public access to the pile; to remove and treat or dispose of contaminated soils under the electric shop and the transfer man way pit, which may continue to be a source of pollution to the underlying groundwater. Institute a basement gas sampling program for those homes that were indicated in the proposed plan. And continue with private or institute private groundwater well sampling as indicated in the plan.

PCEC would like to request along with the Livingston City and County that we be part of any negotiations that the State may have with Burlington Northern. We are particularly concerned about scheduling and time commitments, recognizing that, in fact, the diesel fuel part of this cleanup is going to be the most controversial, and we're concerned, one, that the data that's received will indicate truly -- we want, let me rephrase that.

Just as Becky said, we're concerned that the technologies that are going to be utilized, we don't want the public to think that this is going to recover a hundred percent whatever is there. We're concerned that there may not be enough data to fully appreciate exactly the extent of the contamination. We recognize, though, that this is the part of the plan that's going to take the longest time.

So our request to be part of the negotiations would be to establish a schedule and establish, hopefully negotiate changes to the modified consent decree that then would allow this particular part of the plan to go with community knowledge and with community oversight.

We'd also like to comment on the fact that we are not happy with the ATSDR's efforts as far as their health assessment. We don't believe that the final study actually did anything to alleviate Livingston's citizens' concerns, and we would like to ask the State that they consider additional State resources when trying to remediate both Mission Wye and the railyard activities so there isn't a conflict there. One doesn't take precedence over the other. Additional comments that we have we'll put in writing, but those are the major concerns that the PCEC has.

Response 6: Please refer to Response #1 regarding continued interim actions and public participation in negotiations; and Response #5 regarding free product recovery.

Continued Interim Actions - BNSF sampled three private wells in October 1998 and seven private wells in September 1999 east of the Yellowstone River. Groundwater from two of the private wells contained tetrachloroethene (PCE) at levels below EPA's maximum contaminant level (MCL) for drinking water. In the ROD, DEQ requires that the well inventory be updated and any domestic use well located within the contaminated groundwater plume be monitored on a regular basis. If contaminant concentrations are approaching or exceed EPA's maximum contaminant levels for drinking water, then alternate water (which typically means connection to municipal water) will be provided to the residence at no cost to the well owner.

ATSDR's Health Assessment - After receipt of the comment, DEQ forwarded a complete copy of PCEC's oral comments to ATSDR. These comments were sent to Max M. Howie, Jr., Chief, Program Evaluation, Records, and Information Services Branch, Division of Health Assessment and Consultation, ATSDR, 1600 Clifton Road (E-56), Atlanta, GA 30333 and Danelle Langman at the same address. A copy of PCEC's comments were also forwarded to the ATSDR/EPA liaison, Glenn Tucker, ATSDR Region 8, 999-18th St., Suite 500, Denver, CO 80202. DEQ requested that ATSDR respond to the specific health issues PCEC included in their comments on ATSDR's Public Health Assessment.

In response, ATSDR held a presentation in October 1999 at the Livingston Memorial Hospital that was attended by more than 25 health care professionals. The presentation provided a history of the site, the opportunity for discussion of past and potential exposures, and a description of potential health effects. ATSDR also issued a fact sheet in February 2000 to better explain the results of its Public Health Assessment. The fact sheet encouraged residents to contact Gail Williams with ATSDR at 1-888-42ATSDR for more information.

Additional State Resources for the Facility - DEQ is experiencing significant staff turnover and recruitment difficulties. Often times DEQ must shift limited resources within the section to respond to more immediate risks to citizens across the state. The BN Livingston Shop Complex is a maximum priority CECRA facility. Mandy Cunningham is the current project officer and is focusing her efforts on the BN Livingston Shop Complex and Mission Wye facilities. While DEQ appreciates the commenter's desire for cleanup to occur more quickly, DEQ will not assign additional technical staff to the project given our current resource constraints.

2.7 Comments made by John Mills representing The Burlington Northern and Santa Fe Railway Company

Comment 7: My address is P.O. Box 6403, Bozeman, MT 59771. I'm a consultant to Envirocon who is a contractor to Burlington Northern. My comments are for Burlington Northern. The Burlington Northern Santa Fe Railway Company has been working on this project for ten years, and they are proud of the fact that more than 80 percent of all the remedial work that will be done has already been completed at this site. The final work that remains is what is contained in the proposed plan.

BNSF, in general, agrees with DEQ's proposed plan. We're now finishing work plans to implement portions of the proposed plan in advance of the Record of Decision if allowed to do so by the State. And those generally coincide with what the city would like to see get done in advance.

The chlorinated VOC plume which posed the only really significant potential health risk at this site has declined in concentration more than 90 percent since the early 1990s, due to remedial actions implemented by BN in the early 1990s. And this concentration decline is the reason why no further significant remedial actions are contained in the proposed plan for the VOC plume.

BNSF has removed asbestos, regraded and revegetated most parts of the cinder pile, and based on air sampling, BNSF does not believe that the cinder pile poses any measurable health risk. Regardless of this, BNSF agrees to install another fence to prevent trespassing on the cinder pile and will work with DEQ on a final solution for the cinder pile, in addition to fencing.

The diesel fuel plume is the only remaining issue on the railyard that does not have a straightforward solution. Although this plume covers a large area, it contains only a thin and discontinuous layer of free, liquid diesel fuel, and the great majority of the diesel fuel in the plume is held as residual product in the soil and not as a free liquid. And this is, in fact, why it does not have a straightforward solution.

Based on the results of six previous free product recovery efforts, the BNSF does not anticipate that the free product recovery efforts described in the proposed plan will be easy or efficient. Recovering diesel fuel effectively has been a common problem throughout the country. However, BNSF agrees to proceed with further efforts to this end.

One specific area that BNSF does not agree to work on is in the old tunnel underlying the tracks, as suggested in the proposed plan. Confined space work is one of the most common sources, causes of employee injury and death, and BNSF does not agree to force remediation workers to repeatedly enter confined space, particularly one that has open wells and potentially hydrocarbon vapors in the subsurface.

Based on the thinning and shrinking of the diesel plume that has been measured over the last 10 years, and also based on biodegradation measurements over the last two years, it is clear that the diesel plume has been and will continue to biodegrade naturally. Regardless of the nature of free product recovery efforts that we will undertake, BNSF expects natural biodegradation, and the oxygen-enhanced biodegradation described in the proposed plan is to remove far more diesel fuel from the subsurface than direct free liquid recovery will ever recover. And that's it.

Response 7:

Quantity of Work Completed - DEQ agrees the eleven interim actions have significantly reduced public health risks and environmental threats that were present in 1989; however, it is difficult to quantify and evaluate the amount of work completed in the past and compare it to the quantity of work needed in the future. Past completed activities are set forth in section VI of the ROD; they include removing sources of VOC contamination, underground storage tanks and associated distribution lines, visibly contaminated soil, and sludge. Future activities will focus less on these areas and remediate the remaining contaminated media, including NAPL recovery, to bring the site into compliance with cleanup levels and ERCLs.

Free product thicknesses indicate that a significant amount of work must still be completed. It is difficult to predict the work effort required to complete this task until the Phase I diesel fuel analysis is complete. DEQ is not comfortable stating that 80% of the work necessary to cleanup the site has been completed.

Chlorinated VOC Plume - In addition to the risks posed by the chlorinated VOC plume, the risk assessment also identifies an unacceptable risk to on-site workers from PAH contamination in surficial soils. DEQ has also identified asbestos in the cinder pile as a potential risk to on-site workers and off-site residents (see additional comment below). Petroleum contamination in soil and groundwater also poses a potential risk to on-site workers and off-site residents should petroleum constituents exceed standards in groundwater (see Response #61). DEQ is not requiring active groundwater treatment of VOCs at this time because nine years of data shows a significant decline in groundwater VOC concentrations. DEQ expects that trend to continue with natural attenuation of the contaminants. However, the ROD provides a contingency for localized pump and treat of VOC contaminated groundwater if it appears that natural attenuation will not achieve groundwater cleanup levels in a reasonable time frame.

Cinder Pile - The commenter indicated BNSF's willingness to conduct additional interim actions. BNSF installed the temporary fence around the cinder pile on December 16, 1998 and removed contaminated soils from the electric shop in the Fall of 1999.

Asbestos is a name usually applied to a group of six different fibrous minerals (amosite, chrysotile, crocidolite, and the fibrous varieties of tremolite, actinolite, and anthophyllite). It is a mineral made up of long, thin fibers that appear somewhat similar to fiberglass. Asbestos fibers are very strong and resistant to heat and chemicals. Since the fibers are so resistant, they are also very stable in the environment. They do not evaporate into air or dissolve in water; however, pieces of fibers can enter the air and water from the weathering of natural deposits and the wearing down of man-made asbestos products. Asbestos is a proven carcinogen that causes lung cancer and mesothelioma. (Toxicological Profile for Asbestos, ATSDR December 1995).

DEQ, along with the city of Livingston and Park County, are concerned about asbestos at the cinder pile. Although asbestos was not detected in soil during the RI surficial soil investigation and in the air during ambient air sampling (and therefore not evaluated in the risk assessment), DEQ identified asbestos in waste products collected on the pile in 1991. Waste asbestos from the asbestos processing room in the shop complex was reportedly disposed of at the cinder pile. BNSF removed asbestos from the surface of the pile in 1991, but wind continues to erode cinders

and uncover more asbestos. DEQ evaluated data from Montana's Department of Transportation Maintenance Division road weather informational system for Livingston between January 1999 and July 2001. The average monthly wind gust is approximately 92 miles per hour (mph); the maximum average monthly wind gust is 138 mph and the minimum average monthly wind gust is 66 mph. Therefore, DEQ believes the asbestos does pose a potential health risk. To provide long-term protection of public health for potential exposure to asbestos, the ROD requires that the cinder pile be capped with 18 inches of clean fill and 6 inches of topsoil over the entire pile that will be successfully revegetated. Some regrading may be necessary. In addition, the cinder pile will be fenced and signed to restrict access and deed restrictions will be applied in order to maintain the integrity of the cap.

Free-product Recovery - DEQ believes all remaining issues at the railyard are important, including diesel fuel. Based on Envirocon, Inc.'s product thickness contour maps, DEQ disagrees the diesel plume only contains a thin, discontinuous layer of free, liquid diesel fuel. Figure 3.0 from the Primary Hydrocarbon FS (Envirocon, January 1998) shows free product thicknesses greater than 1.0 feet in a large area in the center of the plume. This information is based on data obtained during the RI and BNSF has not provided any new data since that time which would contradict existing product thicknesses.

BNSF has not adequately characterized the diesel fuel plume because no free product thickness data exists for the center of the plume. Diesel fuel recovery and obtaining accurate free product thickness data are important objectives of the Phase I diesel fuel recovery system specified in the ROD. Additional product thickness data is needed within the center of the plume to develop a comprehensive and cost-effective Phase II free product recovery program. Without this data, estimates of the amount of available free product and the specific length of time required for residual free product to biodegrade are unquantifiable. DEQ agrees with BNSF that a large amount of diesel fuel is adsorbed to soil within the aquifer and vadose zone.

DEQ agrees that diesel fuel recovery is not simple; however, DEQ understands BNSF and other railroad companies have developed creative, innovative and cost-effective diesel fuel recovery systems that have operated effectively in other states. Conventional diesel fuel recovery systems, such as those using belt skimmers, have been successfully installed and are currently operating at other BN sites in Montana. Dividing diesel fuel recovery efforts into two phases will allow for the development of efficient and cost-effective recovery systems.

Biodegradation versus Free-product Recovery - DEQ agrees that biodegradation is an important process contributing to diesel fuel volume reduction but disagrees with BNSF's interpretation that free product recovery efforts are unimportant when considering a total program to remove, degrade or recover diesel fuel. DEQ has researched the literature and EPA guidance and spoken to many experts about diesel fuel remediation efforts and has determined source removal is absolutely critical to effective long-term cleanup efforts. Removing the source will significantly shorten the cleanup time and will eventually increase biodegradation of remaining residual diesel fuel that may be unrecoverable with conventional free product recovery technologies.

In previous discussions, Envirocon argued seasonal groundwater fluctuation spreads free product each season within the smear zone making it available to biodegradation. DEQ disagrees with this speculation and insists, except for a limited time of the year when some downward drainage of diesel fuel occurs soil pores within the smear zone are probably saturated with diesel fuel and contain very little oxygen. Diesel fuel may anaerobically degrade very slowly under these conditions. Consequently, to obtain the greatest benefit from biodegradation, it is critical to remove the remaining source to the maximum extent practicable and then stimulate or enhance biodegradation by adding oxygen. DEQ has performed some cursory biodegradation calculations for free product without source removal and estimated it would take at least 100 years for current estimated free product levels to biodegrade under anaerobic conditions.

MRL Tunnel - In the proposed plan, DEQ identified that recovery would occur along the MRL tunnel and it would be appropriate to consider if the tunnel could be used as a utility corridor for product recovery equipment. In addition, well recovery operations in the tunnel allow for ongoing railyard activities to continue unencumbered. The ROD provides for some flexibility in well placement. However, because the tunnel is believed to be in a location where free product is expected to be thickest, a row of wells will be installed perpendicular to the tracks in the immediate area of the tunnel as indicated in the ROD. With the proper training, investigation and safety procedures, work can occur safely in confined spaces. BNSF expressed concern that petroleum vapors could accumulate in the tunnel. The Occupational Safety & Health Administration allows mitigation measures (such as ventilation) to be implemented to provide a safe working environment. This issue will be required to be adequately addressed in an appropriate health and safety plan.

2.8 Comments from Warren McGee

Comment 8: Warren McGee, 427 South Eighth, Livingston, past chairman of the LIFE committee, a resident of this community all my life, a descendent of people who have lived here since 1880 when the town was only seven years old. And I'd like to say I have a written statement here to give to you, but I don't appreciate the cavalier attitude of Burlington Northern SF that this -- they're doing the best they can. They got to do a hell of a lot better than this. This town I want to return to its pristine environment. And I won't be satisfied with anything less, and I may be dead, but there'll be people to follow. And I don't -- I just don't see, you're so damned smart, you don't really realize what you done to this country. That should be enough.

Response 8: DEQ appreciates the commenter’s desire for BNSF to return Livingston to its former pristine environment. Under CECRA, DEQ may address releases or potential releases of hazardous substances that pose a risk to human health or the environment or that don’t comply with ERCLs. The remedy for the BN Livingston Shop Complex contained in the ROD will obtain groundwater and soil cleanup levels that are protective of human health and the environment and that meet ERCLs. However, DEQ does not have the authority to require cleanup to a facility’s original pristine condition. The natural resource trustees for Montana will determine if a Natural Resource Damage claim (which seeks compensation for environmental damage to state resources) will be pursued.

2.9 Comments from Korkalo representing LRC

Comment 9: Roy Korkalo. Livingston Rebuild Center. P.O. Box 992, Livingston. Livingston has been growing its business for ten years, and during that 10 years, we have had close association with the State, BN and BN's agents. We tried to cooperate during that time and think that the BN, the State and its agents have done an outstanding job in the cleanup this far. We stand ready to do our part, even at our own expense in helping the cleanup continue, with whatever decision the State and the BN arrive at.

Response 9: DEQ appreciates Livingston Rebuild Center's past cooperation and looks forward to continued cooperation as final cleanup progresses.

3.0 RESPONSES TO WRITTEN COMMENTS

3.1 Comments from PCEC

Comment 10: This letter is written to provide the DEQ with written comments regarding the referenced Proposed Plan. We are particularly concerned with the timing of the CECRA process and request that the DEQ and BN move ahead on the activities discussed below. It is not in the best interests of the community to wait the undoubtedly lengthy period required by the CECRA process to finalize the Record of Decision and then wait for negotiations to occur via the mandate of the current consent decree as follows:

> "following selection [of the remedy] parties will enter good faith negotiations to modify the Modified Partial Consent Decree or enter into a new consent decree to provide for implementation of the remedy."

This requirement will further delay action at the site as the negotiations are likely to take many months and another document, the Remedial Design/Remedial Action Plan, is the next required planning document after the Record of Decision prior to beginning field work. Since two field seasons have already passed without any cleanup work being started, the Park County Environmental Council (PCEC) wants the following started in the priority listed below:

- PCEC wants those activities most protective of public health and the environment to be completed as interim actions rather than waiting for the lengthy negotiation/planning process. Those activities are: 1) fence and sign the cinder pile to prevent public access to the pile which contains asbestos, temporarily cover pile to assure asbestos doesn't become airborne. We are aware that DEQ has written a letter to BN requesting action to sign and fence by November 1, 1998 and we expect a status of that action and recommend a local news release accordingly to inform the community of the status. 2) remove and treat/dispose of contaminated soils under the electric shop and at the transfer man way pit which may continue to pollute the underlying groundwater; 3) institute the basement gas sampling program and private groundwater well sampling and analysis.

Response 10: Please refer to Response #1 and Response #6 regarding continued interim actions.

In response to public comment, DEQ met with Scott Murphy from the Livingston Enterprise and a picture and article about the cinder pile appeared in the Livingston Enterprise on January 13, 1999. The temporary fence around the cinder pile was installed by BNSF on December 16, 1998. The ROD requires that the cinder pile be fenced, capped and revegetated; the public will have the opportunity to provide input on the schedule for completion of this activity. BNSF removed contaminated soils from the electric shop in the Fall of 1999 and sampled three private groundwater wells in 1998 and seven private groundwater wells in 1999.

As set forth in Section XII of the ROD, the selected remedy calls for an expanded well use survey and revisiting of basement gas interim actions.

Comment 11: The Livingston City/County and PCEC expect to be a part of any follow on negotiations to assure that a schedule and work plan detail what needs to be done in a timely and accountable manner.

Response 11: Please refer to Response #1 regarding public participation in negotiations.

Comment 12: PCEC is concerned about commitments made during a visit to Livingston of several personnel from ATSDR. The community education promised by the ATSDR did not happen and prior meetings with Livingston citizens and this agency implied that actions would be taken that were poorly addressed in the final Health Assessment.

Response 12: Please refer to Response #6 regarding the ATSDR's Health Assessment.

Comment 13: PCEC is also concerned that DEQ is not applying sufficient resources to address both Mission Wye and the BN railyard activities. In the past couple of years Mission Wye has appeared to take precedent over the railyard. Both sites require attention and actions at either site should not be dependent on availability of state resources.

Response 13: Please refer to Response #6 regarding additional state resources for the facility.

Comment 14: The Proposed Remedy for Diesel Fuel will be the most controversial in that the technologies for cleaning up diesel fuel aren't efficient, are quite costly and take a long time. However, the state law requires the cleanup of diesel fuel and the DEQ proposed remedy is to perform passive recovery via wells used to collect diesel fuel and to install bioventing wells to get oxygen to contaminated soil for biodegradation. Attachment 1 reflects PCEC's concerns regarding the diesel fuel proposed remedy as expressed by our TAG Technical Advisor. We appreciate the opportunity to comment on this document and look forward to the continuing work at the Railyard.

Response 14: DEQ will respond to specific comments in Attachment 1 below.

Comment 15:

Attachment 1

Resource Technologies, Inc.: Comments on the Proposed Remedy and Associated Feasibility Studies for the Livingston Railyard

The Feasibility Study (FS) Reports are, in general, acceptable presentations of the various alternatives that have been considered for remediation at the Livingston Railyard (LRY). The comments focus on the selection and timing.

For the soil and groundwater, RTI concurs with the MDEQ that the remedy should include excavation of contaminated soil from beneath the electric shop and around the transfer pit man way. The excavated soils would be treated to cleanup levels. The FS Report expressed some concern about the risks during execution of these steps, but we believe that these are not severe enough to justify elimination of this source removal strategy.

Response 15: In general DEQ agrees that the FS documents provide sufficient information to select the remedy. DEQ recognizes PCEC's concurrence with the proposed plan to excavate and treat the known remaining contaminated soil from the electric shop and transfer pit manway. Risks to construction workers will not be any greater than other construction activities completed at the BN Livingston Shop Complex site and other Superfund sites containing hazardous materials. BNSF and any contractor will be expected to develop and follow the appropriate health and safety plan for the site. This portion of the remedy is ongoing as an interim action. Please refer to Response #1 regarding continuation of interim actions.

Comment 16: This remedy would include recontouring, recapping, and revegetation of the cinder pile. We share the concern expressed by others that this component of the remedy take place as soon as seasonal conditions allow, as an interim action if need be. Fencing is a useful temporary measure, but does not provide a definitive solution to potential airborne hazards. We recognize that not all portions of the cinder pile are necessarily hazardous, but it would be more efficient and more acceptable to the public, to recap the entire pile rather than attempt to identify and segregate portions of the pile.

Response 16: Temporary fencing was installed around the cinder pile until a permanent cap is installed. The ROD requires recontouring, capping and revegetation of the entire cinder pile; the public will have the opportunity to provide input on the schedule for completion of this activity. BNSF indicated it would submit a work plan for the cinder pile; however, DEQ has not received one to date. More recent discussions with BNSF indicate that it will not submit a work plan for the cinder pile until after the ROD is issued. Please refer to Response #7 for more information regarding the cinder pile.

Comment 17: Probably the most controversial aspect of the FS Reports is that dealing with the diesel free product on the water table. To be blunt, I see a dilemma. There is a regulatory obligation to remove remaining free product "to the maximum practical extent" compelled by the realization that biodegradation takes place at the residual and dissolved-phase edges of free product, not in the heart of a free product plume itself. (Although there are no monitoring wells

in the heart of the plume, the data suggest that the free product could be quite thick in the zone where the MDEQ has proposed installing a network of recovery wells.) Furthermore, there could also be regulatory reluctance to risk sending a message to either the public or the corporate community that anyone thinks, "Oh well, the stuff is down there, and its hard to get it out, so I guess we'll just leave it." I am sympathetic with such a regulatory concern.

On the other hand, the prospect of attempting to remove the remaining free product is not entirely satisfactory. The proposed network of recovery wells necessarily will involve drilling in the tracked area of the active railyard. Although it is impossible to quantify the risk of performing such work, one must be convinced that the benefits are worth a risk before recommending that workers be put in that position. The present diesel plume is neither spreading nor generating mobile dissolved contaminants, and the local groundwater is not being used for human consumption, so the plume is not currently posing a human health risk. Much of the area of the original plume now exhibits thinned and even discontinuous free product. Even if the recovery wells perform as hoped, both the MDEQ and BNSF recognize that technology cannot remove all the diesel from the aquifer.[1] A thin layer of product will remain on the water table, and residual diesel will remain in the pore spaces of the aquifer and overlying unsaturated zone. It appears likely that the well network would be able to recover only a fraction of the total remaining diesel. Thus we will ultimately be dependent on natural biodegradation for the final cleanup, and current groundwater chemistry data indicate that biodegradation is indeed active in the vicinity of the plume. Even if the final conclusion is that recovery wells do make sense, I want the public to be acutely aware of this reality of the messy natural system, rather than have a rude awakening at the end of a multi-year cleanup program when they realize that much (probably most) of the diesel that remained in 1998 is still in the aquifer. It is not unique for a groundwater scientist to recommend that natural biodegradation (± enhancement by addition of nutrients) be the final remedy for hydrocarbon contamination, rather than aggressive technological procedures.

Response 17: Section 75-10-721, MCA, requires DEQ to select a remedy that will attain a degree of cleanup that is protective of public health, safety, welfare and of the environment. Based on RI data, dissolved phase diesel fuel or total petroleum hydrocarbons (TPH) impact

[1] Some technologies are available for removing residual hydrocarbons in some circumstances, e.g. the use of surfactants, but I am not convinced that there are workable safe options for the LRY. Problems involving undesirable mobilization of contaminants (especially in a productive aquifer such as under the LRY) and/or incomplete penetration of surfactants can plague these alternatives. My understanding is that BNSF and MDEQ have not been convinced that these technologies would be applicable at LRY.

groundwater by migrating from free product diesel fuel to groundwater. Dissolved phase diesel fuel was not evaluated and the risk was not quantified in the BRA because cancer slope factors were not available for TPH when the assessment was performed. However, DEQ has concluded based on evaluations contained in its Tier I Risk-Based Corrective Action guidance document (March 2000) that dissolved phase diesel presents a potential health concern at certain levels. In addition, DEQ is mandated to enforce other environmental requirements, including Montana's Water Quality Act that prohibits placing wastes (diesel fuel) where they may impact any state waters, and the federal underground storage tank regulation (40 CFR § 280.64) that require free product to be removed from groundwater to the maximum extent practicable.

PCEC has correctly stated that biodegradation occurs at the fringe of the plume or in the predominantly gas-air saturated portion of the plume. Very little, if any, degradation occurs within the hydrocarbon saturated or water-hydrocarbon saturated portion of the plume. This is the reason free product removal is always recommended before biodegradation can be used as a remediation tool.

DEQ does not believe there is a dilemma. As stated, DEQ has a regulatory obligation to enforce free product removal "to the maximum extent practicable" and to prohibit diesel fuel from impacting state waters. Using a phased approach, the ROD requires passive recovery of free product diesel and natural attenuation of dissolved phase diesel in groundwater. Worker health and safety concerns are of critical importance, as a large portion of the Livingston Complex remains an active facility. DEQ has considered the ongoing operation of MRL and Talgo-LRC, including health and safety issues, when formulating the phased diesel fuel recovery plan specified in the ROD. Please refer Response #5 and Response #7 regarding free product recovery.

Comment 18: The preceding conflicting perspectives on the potential merits vs. possible futility of attempting further diesel recovery at the LRY force me to consider possible options for a middle ground. Perhaps "Phase I" of the MDEQ Proposed Remedy could be initiated with a contingency that the program will be halted if it appears that a thick, definitely recoverable free product layer is not present.

Response 18: Additional groundwater monitoring wells will be installed in areas which may contain the greatest free product thicknesses, such as the central railyard area. During well installation, well log and groundwater monitoring data from existing wells will be used to locate new monitoring wells in targeted free product recovery areas.

Free product has been recovered in previous treatability testing studies. The purpose of Phase I is to determine the most efficient passive recovery methods and to better define the extent of recoverable diesel fuel for implementation of Phase II.

Comment 19: It may seem somewhat surprising that, as a consultant to the citizens' group PCEC, I would publicly consider anything but the most stringent, extensive possible requirements for BNSF, the polluter at the Railyard. I raise these issues primarily because I think it is extremely important for the public to understand the imperfect nature of free product recovery, the significance of biodegradation, and the tradeoffs of risk and benefit, no matter what

the financial resources of the PRP and the conscientious oversight by the State. It is valuable to articulate the nontrivial risk of performing remediation work within the active railyard as well. The MDEQ has overseen substantial remediation tests and interim actions by BNSF at the LRY in the past several years, and the Natural Resource Damage Assessment has yet to proceed; whether the ROD compels BNSF to install further recovery wells or not, observers will not be able to say that BNSF was allowed to simply walk away.

Response 19: DEQ recognizes and appreciates the thought and understanding behind this comment. DEQ agrees it is important for the public to understand the imperfect nature of recovering free product, the importance of biodegradation and the balance between protecting the public from potential risks and protecting workers from risks during cleanup activities. At the same time, DEQ must determine what level of cleanup is necessary based upon the risks posed by contaminants. DEQ considered all the mandated criteria in selecting the phased diesel fuel recovery system. Phase I diesel fuel recovery will involve testing free product recovery technologies for two to three years so sufficient information is obtained to design the Phase II diesel fuel recovery system. Some of the product recovery technologies that will be tested include canisters, various pumps, vacuum enhanced recovery, bioventing and enhanced biodegradation. To increase free product recovery, recovery wells will be installed in areas with the greatest free product thickness measurements.

3.2 Comments from Richard Keller, representing MRL

Comment 20: This is a formal response to the proposed plans to put in recovery wells at Livingston, in the MRL railyard. Montana Rail Link (MRL) desires to continue its commitment to being environmentally proactive and sensitive. We have reviewed your proposed plan and have some safety concerns and recommendations.

We at MRL believe we can operate a railroad without injuring our employees and over the past few years, we have undertaken a significant change in our safety culture. Through 1997, we had our best year ever since the start of MRL with 40 reportable injuries, and currently, through nine and one half months of 1998, we have 10 injuries, a dramatic change from previous years. But we are still not satisfied. As stated before, MRL believes we can operate a railroad without injuring our employees. Over the past four years, about 43 percent of MRL's injuries have occurred in our active railyards. And as an example, in 1995, we had an injury involving an MRL employee running into a monitoring well in our Laurel railyard. The employee required twelve sutures and lost two working days. So you can see, we are concerned about the placement of the monitoring wells in the middle of the Livingston railyard.

During MRL safety meetings and safety audits, our people have constantly brought up conditions in yards and on the right-of-way to reduce tripping hazards, as well as reducing outside contractor activities on our property.

In your plan, you have proposed over forty wells be installed immediately in or adjacent to our active railyard in Livingston. Throughout our Livingston railyard complex, we have many physical obstacles; electrical, gas, industrial and municipal waste piping, signal wires, communication cables, and US Sprint lines. That would make the installation of these wells very

tedious and difficult to do. As it is an active railyard, the installation would have to be coordinated with the railroad, especially for the wells that would be installed between tracks in the yard.

All MRL crafts, operating, mechanical and maintenance of way are working in conjunction with each other among random moving trains and free moving cars. Movement of trains and/or cars can be made in any direction at any time, in a close working environment. Track centers are as close as thirteen feet from each other, leaving only three to four feet between cars on adjacent tracks.

More importantly, we are very concerned with the safety of our employees and outside contractors during construction and after, during collection procedures required of these wells as outlined in this proposal.

Our employees work under Company and Federal Regulations to ensure their safety. These rules are complex. Outside contractors are required to be accompanied by an MRL flagman certified on these rules, or be completely trained and approved by MRL before they can work on MRL property. We feel our employees would be subjected to risk of injury due to these proposed wells and the additional activities of contractors having to be in our yard to monitor and operate these wells.

Because there is no data for the Livingston railyard showing that this type of passive recovery will work, we ask that phase one remain outside of tracks one through fourteen. Then, if these wells prove to be productive in recovering an acceptable amount of product, MRL would like to be intimately involved with phase two as to where and how additional wells may be installed. We have one hundred and nineteen employees living and working in the Livingston area. Please consider the above proposal or some other alternative to mitigate the possible increased risk of the safety of persons having to work in the yard.

Response 20: Please refer to Response #3 regarding worker safety. Many of the old monitoring wells at the BN Laurel railyard are "stick up" wells; several of these have been destroyed by equipment. All of the proposed wells within tracks at Livingston will be "flush-mounted" and should pose no trip hazard to workers using the area. The worker safety issue has received much consideration while planning the placement of recovery wells within the active railyard. The Phase I diesel fuel recovery system will locate and install 70% of the wells along abandoned track 4, where the working distance between tracks is 27 feet instead of 13.5 feet, and along the Park Street right-of-way, a safe distance from the mainline. Only five wells will be located within the most active portion of the railyard during Phase I. These wells will be installed along the tunnel area south of the MRL shop building where free product thickness may be one foot or more. Two monitoring wells are also proposed on either side of the tunnel area to measure free product. Six wells will be installed east of the MRL shop building because this area contains 0.5 feet of free product or more and the distance between tracks into the MRL shop building is greater than 13.5 feet.

While constructing Test Cell 4 Envirocon demonstrated by careful planning, communication and utilizing train traffic controllers and flagmen, that workers can use heavy equipment within active

tracks to install a large recovery system without accident or injury. DEQ requested, and MRL has submitted its safety plan to DEQ. MRL and Talgo-LRC will be consulted on the separate safety plan required for Phase I implementation. DEQ will consult with MRL and Talgo-LRC in designing and locating wells for the Phase II diesel fuel recovery system. DEQ encourages MRL to provide any information it believes pertinent to further reduce safety risks to workers during any of the cleanup activities.

3.3 Comments from the City of Livingston

Comment 21: Please consider these comments that I am delivering tonight preliminary comments on behalf of the city of Livingston as I will be reviewing them for final adoption by the City Commission prior to submitting them as our final written comments before November 22, 1998.

Response 21: DEQ considers the written comments received from the city of Livingston to be final comments and responded accordingly.

Comment 22: These comments are in response to the proposed remedy for the final clean up of the Livingston Railyard which was presented to the public on September 22, 1998. It is our understanding that this plan is a draft of the final "Record of Decision" and presents the DEQ's preferred remedies for cleaning up the remaining soil contamination and diesel fuel on top of the ground water and in and around the BN site. Once final written comments are received by November 22, 1998, approximately five months will be needed to complete the Record of Decision. When the "Record of Decision" is completed, then the parties (BN and the State Department of Environmental Quality) will negotiate a new consent decree to provide fair implementation of the remedy. Finally, after the consent decree is completed, a "Remedial Action Document" must be developed prior to implementation of the "Record of Decision" under the new consent decree. This process could easily extend beyond the year 2000!

Local Representation in Final Consent Decree - The City feels strongly that interim actions should be implemented wherever possible and that local representation including the City, County and Park County Environmental Counsel's representation should be included in a final negotiation of the consent decree and record of decision implementation, operations and maintenance, and closure of this site. In concurrence with Representative Bob Raney's October 15, 1998 letter which I have enclosed, the City will be writing the Governor to demand that our community have a representative present at all negotiations between BN and DEQ concerning the final consent decree and resource damage award. We also request that all negotiations be held with open doors.

Response 22: DEQ experienced resource contraints and encountered issues not addressed in the proposed plan during the development of the ROD. DEQ apologizes for the length of time it has taken to issue the ROD, but believes all the risks to human health and the environment are adequately addressed by the ROD. Please refer to Response #6 regarding additional state resources for the facility, and Response #1 regarding continued interim actions and public participation in negotiations.

Comment 23: Comments on Proposed Remedy - With regard to the proposed remedy for final cleanup, the following are specific issues and concerns:

1. Proposed Interim Actions - In the spirit of trying to accomplish the best cleanup of the contaminants on the site, we encourage the following activities: (As you can see from the enclosed October 6, 1997 letter from the Park County Environmental Council, the community continues its encouragement to move forward with the cleanup while the final plan and consent decree are being negotiated.)

    1. Fence and sign the cinder pile to prevent public access to the pile which contains asbestos by November 1, 1998 - See October 5, 1998 letter from John Wadhams of the DEQ to Judy McDonough of the Burlington Northern/Santa Fe Railroad regarding "Burlington Northern/Santa Fe Livingston Site Temporary Fence Around the Cinder Pile". We concur with this action as a temporary action only. The City's interest is to see this cinder pile which contains asbestos removed from the community ultimately as it will continue to be a potential problem for generations to come if it is not extracted from the community.
    2. Remove and dispose/treat the contaminated soils under the electric shop and transfer the man way pit which may be continuing to pollute the underlying groundwater.
    3. Institute a basement gas sampling program in private ground water well sampling.

Response 23: Please refer to Responses #1 and #6 regarding continued interim actions, and Response #7 regarding the cinder pile. The volume of material in the cinder pile is estimated at 202,000 cubic yards. DEQ has determined it would not be cost-effective to remove the pile and may actually increase airborne asbestos and public health risk if the cinder pile is moved off-site. Recontouring and covering the pile with clean soil may increase the potential for asbestos to become airborne in the short term, but this concern can be controlled by careful planning and wetting of the soil as it is moved during recontouring of the pile. Work should occur during the time of day when winds are minimal. These and other construction specifications will be spelled out in the approved cinder pile work plan. DEQ will emphasize protection of public health and worker safety during construction activities at the cinder pile. Engineering controls and personal protection equipment will be used to minimize worker exposure. The clean soil cover and vegetation will be checked at least once each year to ensure the cap is intact and not eroding. The cinder pile will remain fenced and signed and institutional controls will be placed on the property to prevent the cap from being compromised.

Comment 24: Potential Health Effects from Past Exposures - It's our feeling that the Agency for Toxic Substances and Disease Registry Report was inadequate in the sense that it did not assist the community in understanding the potential health effects from past exposures to the soil contamination and diesel fuel and solvent contamination which has been created and compounded over the course of the last nearly 100 years. We request that the community education requested by the Park County Environmental Counsel from the ATSDR be provided to

Livingston residents who have been exposed to these contamination levels for extended periods of time.

Response 24: Please refer to Response #6 regarding ATSDR's Health Assessment.

Comment 25: Encourage Additional State Resources for Multiple Clean Up Sites - We feel that the redirection of Mr. John Wadhams, the project coordinator for DEQ for the BN site, in the midst of his working on this site, delayed completion of this cleanup. We recommend that in the future additional staff be assigned to additional cleanup sites so that individual cleanup projects can be accomplished in a timely manner.

Response 25: Please refer to Response #6 regarding additional state resources for the facility.

Comment 26: Diesel Fuel Recovery - The City concurs with the State's preferred remedy for diesel fuel recovery which involves both passive recovery and bioventing to be implemented in a phased approach with the second phase building on information gained through implementation of phase one. We feel it is particularly important to get more data from the installation of new wells at the center of the diesel plume to measure product thickness. In summary, however, we support the State's plan for diesel fuel recovery in total, but express our dismay over the limited recovery which appears to be possible with current technologies.

Response 26: Please refer to Response #5 and Response #7 regarding free product recovery.

Comment 27: Continued and Consistent Local Monitoring - We as a community are very concerned about maintaining a consistent local monitoring effort throughout the whole project so that the status of the cleanup effort in comparison to the goals identified in the record of decision can be monitored and influenced where necessary by the community. We are therefore interested in securing financial assistance to ensure that local technical assistance and support (technical and possibly legal) is available to assist the community in ensuring that work is completed as per plans and in accordance with environmental laws.

Response 27: The ROD requires monitoring of: 1) any domestic use well that is currently in use, which is located within the groundwater plume; 2) a network of monitoring wells for both dissolved chlorinated solvents, lead, and dissolved and free product diesel fuel; and 3) indoor air in representative homes. The monitoring is necessary to protect human health, evaluate cleanup progress, track potential diesel and chlorinated solvent plume movement, evaluate monitored natural attenuation (MNA), and ensure compliance with ERCLs. Montana's Comprehensive Environmental Cleanup & Responsibility Act (CECRA) does not provide for funding to local governments or citizens groups that are involved in overseeing cleanup at sites; therefore, DEQ is unable to provide funding to the City of Livingston to participate in oversight of cleanup activities. DEQ's project officer is able to provide technical support to the City of Livingston in interpreting information and cleanup activities at the site. EPA provides Technical Assistance Grants (TAG) to sites that are proposed for listing or listed on EPA's National Priorities List (NPL). The BN Livingston Shop Complex was proposed for listing on the NPL in August 1994; however, the listing was not finalized. EPA did provide a TAG to PCEC to monitor cleanup at

the site. DEQ will support PCEC if it seeks to extend the EPA TAG grant to assist with monitoring issues.

Comment 28: In summary, we would like to thank the Department of Environmental Quality, the Burlington Northern/Santa Fe Railroad, local representatives like those members of the LIFE Committee, Park County Environmental Committee, and other interested community representatives for their efforts and input to this important cleanup process. The city of Livingston is interested in ensuring that ground water contamination, soil contamination and potential contamination in our air from asbestos blowing from the cinder pits is mitigated for the long term. It is in our children's interests and their children's children's interest that we seek the best solution for cleaning up the problem areas identified above as soon as possible.

Response 28: Comment noted.

3.4 Comments from Montana House of Representatives - Representative Bob Raney (attached to the city of Livingston's comments)

Comment 29: The issues surrounding the cleanup of the Livingston BN pollution site are, and always have been, very difficult to understand. With that in mind, I am relaying, my concerns about the process which our community presently faces concerning the Final Consent Decree. That decree will implement the BN Livingston Shop Complex Proposed Plan (the Final Remedy) upon which we are presently commenting.

It is my understanding that once the Final Remedy is selected, BN and the State (represented by the Department of Environmental Quality) will negotiate the final decree. I believe that during, that process of negotiating the final decree, the attorneys involved may negotiate to water down the Final Remedy to where little or nothing, remains. Our community has been through a tough struggle on this issue for 14 years. We deserve more than a few attorneys, who are not connected to Livingston, deciding our fate behind closed doors.

The future of the pollution under our town may well be put into the hands of two attorneys, one from BN and one from DEQ (representing our interests??). And, if my suspicions are correct, the two attorneys who may be doing, the negotiating are personal friends.

Lots of people from our community have poured countless hours, days, months and years into getting, the best clean up possible. Two major hurdles remain after the adoption of the Final Remedy - the Final Consent Decree and the Resource Damage Award. Our community must once again get actively involved, or we will get the short end of the stick.

Therefore, I would urge you write the Governor and demand that our community have a representative present at all negotiations between BN and DEQ concerning the Final Consent Decree and Resource Damage Award. I believe you should request that all negotiations be held with open doors as well.

Thank you for your attention to this matter.

Response 29: Please refer to Response #1 regarding public participation in negotiations. DEQ's attorney will represent the citizens of Montana; there is no collusion between attorneys for BNSF and DEQ. Montana's natural resource damage trustees, in coordination with Montana's Natural Resource Damage Program, will determine if assessment and litigation are warranted at the site and what public participation is allowed.

3.5 Comments from PCEC (attached to city of Livingston's comments)

Comment 30: This letter is written to express our concern over the delay in completing and presenting the Feasibility Study and Proposed Plan for the Livingston BN Railyard CECRA site. From our prior conversations we anticipated cleanup activities continuing at the site this summer and also expected a public meeting presenting the Feasibility Study and Proposed Plan for the primary hydrocarbon, soils and groundwater contamination. The length of time it has taken to finalize the report is unreasonable. We are also concerned that the remaining contamination at the Railyard is not being cleaned up in a timely manner. The soil contamination at the old Electric Shop and the free product remaining at the freight train refueling area is of particular concern and we expected action at those sites this field season. Since the delay appears to be political rather than technical we are asking for a written response as to the status of the field work and Feasibility Study/Proposed Plan so we may determine whom to contact to address the schedule delays. Thank you for your assistance.

Response 30: The delays are not political; DEQ experienced resource contraints and encountered technical issues not addressed in the proposed plan during the development of the ROD. DEQ apologizes for the length of time it has taken to issue the ROD, but believes all the risks to human health and the environment are adequately addressed by the ROD. Please refer to Response #6 regarding additional state resources for the facility.

3.6 Comments from Warren R. McGee, Ex-LIFE Chairman

Comment 31: Action to be required to attempt some clean-up of BNSF pollution of the city of Livingston.

Remove entire cinder pile from the site because it will continue forever to uncover contaminants detrimental to the health of Livingston residents and future commerce within the city of Livingston and monies should be advanced to the city to provide the best medical attention to residents in the future. We have lost too many residents and NPR of BNSF employees to unknown causes in the past.

The cinder pile was begun in 1948 of weekly dumps of four or five gondolas of unburned sulphurous coal, asbestos lagging from steam engine boilers that were overhauled in Livingston Roundhouse monthly from 1948 through 1954 and any other garbage, oils, greases and chemicals used by NPR and as a "dump" since 1954 when diesel locomotives were employed exclusively by NPR or BNSF.

Response 31: Thank you for your historical information of dumping at the cinder pile. Please refer to Response #23 regarding removal of the cinder pile.

DEQ does not know of any monies available in Montana to monitor and provide medical attention to residents or their families. ATSDR has limited funding available nation-wide. Please refer to Response #27 regarding funding for overseeing cleanup.

Comment 32: Continued efforts employing latest technology to evacuate unknown gallons of diesel oil dumped wantonly on yard tracks, from "C" street to stockyard tracks (about Q street) at eastern end of Livingston. Since 1954 when Northern Pacific/BN, Inc. mechanical forces wanted diesel loco's fuel tanks on these units which held + or - 2400 gallons on each unit, evacuated for shop forces to overhaul these motors in local shops. This action occurred weekly, and dirtied many employees households rugs and precipitated many family arguments, "who done it" subject matter. And to make a bad environment worse, BN, Inc. gave its Livingston shop employee's over 50-52 gallon barrel's of carbon tetra chloride (CCL4) to use on their home "do it yourself" mechanical projects. Are some of these barrels in use by un-informed residents? That indicates the irresponsibility of the offending parties to Livingston residents past, present & future. I have no idea how many dollars it will take to build, staff and maintain the health of Livingston residents in the years to come, but BNSF should be required to pay that expense forever for Livingston residents who live or lived down wind or down stream from BNSF base of operation. Here in Livingston, Montana, we deserve that at least.

Response 32: The ROD requires recovery of free product diesel fuel from groundwater followed by bioventing of residual diesel fuel in the soil and MNA of dissolved phase petroleum. DEQ has received previous reports about dumping diesel fuel along track 11 so repairs could be made on fuel tanks. This information may explain the east to west elongated shape of the diesel plume and why the thickest amount of free product is in this area. Phase I will included installation of wells in this area. Please refer to Response # 5 and Response # 7 regarding free product.

DEQ has received reports about cleaning solvents given to BN workers when the shops closed in 1986 but has no documentation to support those reports. Groundwater analytical data do not indicate off-site sources of VOCs in the groundwater. DEQ encourages anyone with specific information about drums of cleaning solvents from the shop complex being used outside the railyard to contact DEQ.

Although retrospective epidemiological health studies are difficult to complete, DEQ worked with ATSDR on three health studies that investigated whether environmental contamination at the BN Livingston Shop Complex is related to specific health problems in the community. ATSDR did not identify an association between environmental contamination at the site and pancreatic cancer. Under CECRA, BNSF is liable for cleaning up the site; however, DEQ has no statutory authority that requires BNSF to pay to "maintain the health of Livingston residents in the years to come."

3.7 Comments from Jean O. Cole

Comment 33: I commend you for trying to cleanup the environment. I have lived some years adjacent to the site of the abandoned Q Street well. In the past there was a very strong odor on my property which I assume was from the contaminants in the soil. Since the last flood I do not

notice it so much. My property was flooded after the city put in a dike beginning at the corner of Q Street and East Lewis Street going (east) toward the Yellowstone River. This is the corner where the Q St. well is located. I do believe the railroad contamination naturally drains in my direction perhaps along old natural waterways that existed in the past and which have since been buried with later expansion of dwellings and landfill.

Response 33: Your home is located at a lower elevation than the BN Livingston Shop Complex, but current data from the site indicates that the majority of petroleum contaminated groundwater is located within the railyard, with a small portion extending slightly south of Park Street. Also, recent groundwater monitoring of monitoring wells located between the railyard and your home indicate that the chlorinated solvent plume does not extend below your property. The RI did not indicate significant soil contamination in residential areas beyond the railyard. In 1988, the Q Street municipal water supply well was abandoned because of chlorinated solvent contamination in the well. The contamination was detected at levels below EPA's maximum contaminant levels for PCE in drinking water. It is unlikely that the low levels of chlorinated solvents in the groundwater at that time would have caused the odors. DEQ does not know the source of the odors you noticed in the past. DEQ is unable to assess past risks to contamination and without environmental data from earlier years of railyard operations, it is difficult to speculate how early contamination at the site may have caused odors. However, the ROD sets forth a remedy that is protective of current and future risks to human health and the environment and requires monitoring of both the chlorinated solvent and petroleum plumes to ensure the plumes are not migrating or expanding.

Comment 34: At this point in time the air and noise pollution from LRC and MRL is of greater concern to most Livingston residents. They continually leave sick diesel units rumbling and howling and belching fumes day and night in the railyard. People have to use noise masking machines in order to get any rest or sleep and are forced to breathe the fumes day and night.

They must have dumped or spilled a goodly amount of diesel fuel about two weeks ago - I woke up during the night choking on diesel fumes and had to close all the windows and use my air cleaner in order to breathe. I do hope you will consider doing something about this air and noise pollution as well as the soil pollution. It would certainly improve the health of Livingston residents.

Back in the 1960s one of the Middle East countries - Lebanon - banned importation of diesels and set a time limit for phasing out use of those already in the country because of air and noise pollution. Just recently I heard that some California officials smartened up and were putting restrictions on diesel use because of the pollution they caused.

There must be some way to reduce or stop air and noise pollution in Livingston.

Response 34: DEQ has received other similar concerns about the noise and air pollution emanating from existing operations at LRC and MRL, especially during atmospheric inversion events. DEQ understands the concerns of those living adjacent to a railyard facility. However, a superfund remedy will only alter existing operations to the extent operations cause or affect recontamination of remediated media or cause or affect exceedances of cleanup standards.

Although not directly regulated by CECRA in this instance, the circumstances described by the commenter are regulated pursuant to the federal Clean Air Act. In 1998, EPA established emission standards for nitrogen oxides (NOx), hydrocarbons, carbon monoxide, particulate matter and smoke for newly manufactured and remanufactured locomotives and locomotive engines. These had previously been unregulated. These standards began to phase in last year and will result in the achievement of approximately a two-third reduction in NOx emissions and a 50 percent reduction in hydrocarbons, and particulate matter emissions. For more information, see EPA's website: http://www.epa.gov/otaq/regs/nonroad/locomotv/.

In an attempt to resolve similar complaints in the past, LRC moved the load testing station located on the east side of the shops to the west side of the shop buildings. LRC officials have also discussed the possibility of constructing a hood and stack over the load testing station to help disperse diesel exhaust. This building has not been constructed. The local environmental group, PCEC, has had discussions with LRC about the diesel exhaust problem and is working with LRC to arrive at a solution.

3.8 Comments from BNSF represented by Browning, Kaleczyc, Berry & Hoven, P.C.

The Burlington Northern and Santa Fe Railway Company ("BNSF") provides the following comments on the Proposed Plan for the Livingston Shop Complex. In addition, BNSF hereby incorporates by reference all prior correspondence, comments, and reports submitted to the Montana Department of Environmental Quality ("DEQ") and its predecessor agency, from BNSF or BNSF's consultants. BNSF also incorporates, by reference, Envirocon's comments on the proposed plan, being submitted under separate cover (also attached).

Comment 35 (A) Electric Shop: BNSF generally agrees, with certain exceptions, with DEQ's Proposed Plan for the Livingston Shop Complex. BNSF agrees to proceed with the source control work outlined in the Proposed Plan. In fact, BNSF will be submitting for DEQ's review and approval, a work plan for the electric shop portion of the excavation work. BNSF believes that the electric shop work plan can be implemented as an Interim Action under the Modified Partial Consent Decree (December 1989). BNSF will treat, with lime and soil vapor extraction ("SVE"), the soil exhibiting a hazardous characteristic to meet the land disposal restrictions, if disposed on land.

Response 35(A): In addition to exhibiting hazardous characteristics, DEQ has determined that the soil around the electric shop is a listed hazardous waste. Please refer to Response #1 regarding continued interim actions.

Comment 35(B) Groundwater: BNSF agrees to work with DEQ, Park County, and the city of Livingston to implement the institutional controls related to the use of groundwater at the facility. In addition, BNSF agrees to develop a groundwater sampling schedule with DEQ to monitor remediation efforts.

Response 35(B): DEQ believes institutional controls (Ics) are an important part of the ROD to ensure the protection of human health. Establishment of a controlled groundwater area is one IC DEQ believes is appropriate for the site. In addition, the ROD requires restrictive covenants to be placed upon the railyard property to help ensure that the use remains industrial and that no excavation occurs on or within the cinder pile. Please refer to Response #27 regarding the monitoring requirements in the ROD. DEQ will work with BNSF and the public to develop an appropriate groundwater monitoring program.

Comment 35(C) Hydrocarbon/Free Product Plume, paragraph 1: The plan defines free product as "diesel fuel floating on top of the groundwater." This definition is confusing and not technically based. As used in these comments, BNSF relies on the common technical definition of free product, which defines free product as "product that will drain under the influence of gravity into a well" ("free product").

The past ten (10) years of groundwater monitoring has already shown that the free product plume is not migrating, nor are dissolved hydrocarbons migrating away from the plume in the underlying aquifer. Moreover, the plume is biodegrading naturally. However, BNSF agrees to proceed with additional "free product" recovery, although BNSF believes that a different approach from the one called for in the Proposed Plan would be even better suited to achieving DEQ and BNSF's goals for remediating the "free product" plume. In addition, BNSF agrees with DEQ's phased approach to remediate "free product."

BNSF, for safety reasons, is opposed to drilling through the tunnel beneath the tracks or having workers conduct remediation activities in the tunnel. The basis for this opposition is that significant and unacceptable risk to workers safety would result in drilling through the tunnel and placing workers in a confined area.

BNSF would like to clarify, for purposes of these comments, that the use of the term "bioventing" in relation to free product cleanup means "bio-venting" or "bio-remediation," and is not to be confused with "soil vapor extraction" used in relation to the remediation of volatile organic compounds, or "bioventing" used exclusively to remediate vadose zone contamination by hydrocarbons.

Although, BNSF agrees to proceed with additional recovery efforts, BNSF believes that, given the lack of risk posed by the plume to the public, exposing remediation workers, Livingston Rebuild Center personnel, and Montana Rail Link personnel to a continuously high risk work situation is inconsistent with the goals of decreasing the overall risk at the facility. In addition, given that the plan does not cite an unacceptable risk associated with the free product, DEQ's evaluation of cost-effectiveness is inadequate and does not comply with §75-10-721, MCA.

Response 35(C): DEQ is using the regulatory definition found at 40 CFR 280.12, and guidance that further defines free product as "immiscible liquid phase hydrocarbon existing in the subsurface with a positive pressure such that it can flow into a well." DEQ will consider BNSF's definition of free product when reviewing BNSF's comments. Please refer to Response #81.

DEQ agrees that based on the existing monitoring well system, diesel fuel and dissolved hydrocarbons may not be migrating away from the diesel plume in the underlying aquifer. However, it should be noted the existing diesel fuel monitoring network is primarily limited to the outer fringes. In addition, monitoring wells down gradient from the diesel plume are not in locations that could conclusively state diesel fuel and dissolved hydrocarbons are not migrating away from the diesel plume. Furthermore, TPH and TPH chemical constituents have been detected in groundwater at some monitoring wells, including the Depot and freight train refueling areas. One of the objectives of the Phase I diesel recovery plan is to install additional monitoring wells east and south of the diesel plume. Two additional diesel fuel monitoring wells will be properly constructed and installed at the leading edge of the plume and four monitoring wells will be installed at the southern edge of the diesel plume to monitor for potential migration of diesel fuel and dissolved hydrocarbons in groundwater.

Please refer to Response #7 regarding the MRL tunnel. In our initial evaluation of drilling through the tunnel, DEQ conferred with a drilling contractor experienced in drilling through old mine adits. The contractor believed that because of the satisfactory age of the tunnel, there would be no reinforcing steel in the concrete and penetration would be feasible. As part of remedial design, the structural stability of the tunnel will be evaluated.

The definition of soil venting given in the proposed plan is "Soil venting (also referred to as bioventing) - In situ microbial degradation of contaminants by introducing oxygen into the subsurface." DEQ intends the use bioventing to introduce air into the subsurface to aid in the microbial degradation of petroleum constituents trapped in the vadose zone, particularly in the smear zone above the water table. Although not its primary purpose, it would not be unexpected for bioventing to also volatize and remove some lighter-end petroleum constituents from free product or soil contaminants. DEQ will use the term bioventing in the ROD.

DEQ has a regulatory obligation to remove free product to the maximum extent practicable and protect groundwater. The performance of the Phase I recovery system will be evaluated after two to three years. Please refer to Response #17 regarding the unacceptable risk from petroleum and Response #85 regarding cost-effectiveness.

Comment 35(D) Cinder Pile: BNSF has fenced the cinder pile. In addition, BNSF will proceed with sampling the surface soils of the cinder pile, and will work with DEQ to develop an appropriate remedy for the cinder pile. Such a remedy may include capping and/or re-contouring the cinder pile.

Response 35(D) Cinder Pile: Please refer to Response #7 and Response #23.

Comment 35(E) Sampling: BNSF agrees to sample indoor air as requested by DEQ. However, as with earlier indoor air sampling, the results are often very difficult to separate from background, and therefore may not be directly attributed to the Livingston Railyard.

Response 35(E) Sampling: DEQ appreciates BNSF's commitment to perform indoor air sampling. Please refer to Response #78.

Specific Comments from BNSF on the Proposed Plan

Comment 36: Page 1, 1st Paragraph, Executive Summary: Please change to "The Burlington Northern and Santa Fe Railway Company."

Response 36: Change noted. The Burlington Northern and Santa Fe Railway Company will be cited as the correct company name in the ROD.

Comment 37: Page 1, 5th Paragraph, Executive Summary: No free product has been detected at the Depot Area and no remediation was anticipated or included in the FS.

Response 37: The fact that BNSF did not include the depot area in the FS document does not justify ignoring this potential problem area. Early on in the investigation, free product was detected in monitoring well LG-11 located on Main Street. Product thickness measurements have never been made in monitoring wells along Main Street. The ROD includes field activities to measure free product and residual diesel fuel in the depot area and recovery of diesel fuel, if necessary. It also requires that once free-product is removed to the "maximum extent practicable" monitoring for natural attenuation of dissolved phase petroleum will be implemented. If additional data confirm that there is no free product at the depot area, then natural attenuation monitoring will be initiated to ensure that the dissolved phase diesel is naturally attenuating.

Comment 38: Page 1, 8th Paragraph, Executive Summary: The phrase "high levels of contamination" is unnecessarily alarming and has no particular technical meaning; and should not be used to characterize measurements made in micrograms per cubic meter.

Response 38: The phrase "high levels of contamination" was not meant to alarm readers. Due to the abbreviated nature of the proposed plan, the phrase was used to distinguish between homes with levels of contamination that present an unacceptable potential risk and require mitigation from those homes with acceptable levels of contamination. This language is not in the ROD.

Comment 39: Page 2, 2nd Paragraph, Introduction: The plan states "DEQ believes the preferred remedy would meet public preferences for completing the cleanup." This sentence is not consistent with CECRA or CERCLA. Remedies must be evaluated against 8 criteria, public comment is only a modifying criterion.

Response 39:
The statement is not intended to provide an evaluation of the State's preferred alternative based only on the public comment criterion. The statement was made as a general statement to imply that based on issues which are important to local residents, namely, diesel fuel, electric shop soil and the cinder pile, the community would accept and encourage the State to pursue it's preferred remedy to complete cleanup at the site.

Thirteen various companies, individuals, local governments, and a citizens group commented on the proposed plan. While about half of the commenters encouraged remedial action for the cinder pile, three commenters thought the entire pile should be removed and disposed of at an

off-site location. Two commenters did not believe the cinder pile poses a risk, but proposed recontouring and some capping of the pile. Two commenters supported the remedial action for the cinder pile outlined in the proposed plan. Others had no comment regarding the cinder pile.

Seven commenters supported the remedial action for the electric shop soils and transfer pit manways outlined in the proposed plan. Others had no comment regarding the electric shop.

Five commenters supported additional monitoring of private groundwater wells and sampling of indoor air in homes. One commenter expressed concern about distinguishing between contamination from the site and ambient and household concentrations due to other potential sources.

One commenter wanted the site cleaned up to pristine conditions and two commenters did not believe cleanup was required of the petroleum contamination because it did not pose a risk and there were no cleanup levels identified in the proposed plan.

One commenter requested monies to cover medical costs of those people affected by the site. Two commenters requested monies to participate in the oversight of cleanup activities.

Four commenters supported free-product recovery, but some expressed concerns that it would not be 100% effective and that there were safety concerns associated with the free-product recovery and bioventing. One commenter suggested surfactants be used at the site instead of bioventing. One commenter only expressed safety concerns. Two other commenters disagreed with free-product recovery.

One commenter requested that the selected remedy address current noise and emissions from locomotives in the railyard.

The selected remedy meets the requirements of CECRA as amended in 1991 and complies with CERCLA to the extent practicable. Please refer to Section IX “Summary of Comparative Analysis of Alternatives” and Section XI “Statutory Determination” of the ROD.

Comment 40: Page 4, 2nd Paragraph, 1st sentence, Site Background: This sentence should state, "Primary sources of contamination on the site were from locomotive fueling and rebuilding, cleaning and maintenance, waste oil reclamation and wastewater treatment."

Response 40: Although some of the contamination such as sludge and VOCs in soil have been removed from the site, other contamination, such as diesel fuel, residual VOCs in soil and groundwater remain on-site. Therefore, it is appropriate to refer to remaining contamination using are instead of were.

Comment 41: Page 4, 6th Paragraph, Site Background: It should be clarified that the Livingston Shop Complex facility is not listed by the EPA on the Superfund National Priorities List ("NPL") and it is not anticipated that the site will be listed in the future.

Response 41: DEQ agrees that if the site is remediated pursuant to CECRA, and adequately protects human health and the environment, EPA would not likely list the site on the NPL. However, EPA funds the technical assistance grant for PCEC, stays apprised of developments at the site, and is aware of the contents of this ROD. EPA maintains all its authorities.

Comment 42: Page 4, 7th Paragraph, Site Background: The RI did not determine that the outdoor air was impacted as stated in this sentence.

Response 42: DEQ agrees this sentence implies outdoor air (ambient air) is contaminated from Superfund site contamination and cleanup activities. This was not DEQ's intent; the language in the ROD clarifies this issue.

For clarification, during current load testing of locomotives at LRC, exhaust from existing operations may impact outdoor air. DEQ has received several complaints from residents about diesel locomotive exhaust. These complaints are typically investigated by the Enforcement Division. PCEC is also concerned about this issue and is working with LRC to resolve it. However, it should be noted that DEQ determined indoor air in some homes is impacted by site contamination and basement gas sampling will be performed to determine if indoor air in homes poses an unacceptable risk to residents. Please refer to Response #1.

Comment 43: Page 7, 2nd Paragraph, Site Background, Soil: This paragraph, which begins with "Between 1992 and 1995 . . ." is misleading. Of the 107 soil samples collected and analyzed, only 13 samples contained VOCs above the established cleanup levels.

Response 43: Thank you for the clarification; however, the paragraph accurately identifies areas of remaining soil contamination at the time of the proposed plan that needed to be remediated. However, in 1999 due to changes to WQB-7, DEQ revised the soil cleanup levels for chlorobenzene and vinyl chloride. The new WQB-7 standards altered the outcome of the soil cleanup levels, which were based on preventing further leaching of those contaminants that would cause exceedances of the contaminants in groundwater. Based upon the revised cleanup levels, the cinder pile meets the soil cleanup level for chlorobenzene; however, the ROD requires the cinder pile be remediated because of the potential risk posed by asbestos containing waste in the pile. These areas requiring remediation are specifically addressed in the ROD.

Comment 44: Page 7, Last Paragraph, Site Background, Soil: Visible asbestos was removed during sludge removal activities. Thirteen soil and two air samples collected both upwind and downwind of the cinder pile did not show any asbestos migrating from the pile.

Response 44: Comment noted. However, although all visible asbestos was removed from the surface of the cinder pile in 1991, wind and precipitation continues to erode cinders and could uncover asbestos.

Comment 45: Page 8, 1st Paragraph, Hydrocarbons (Diesel Fuel): The plan states, "more than 70 percent of the diesel fuel may be absorbed to soil." The plan should explain that, therefore, this fuel is immobilized in the subsurface and does not constitute "free product."

Response 45: The term "absorbed" may have been used too broadly. A portion of the diesel fuel trapped within soil and included in the 70 percent figure is thought to be held by surface tension and other physical properties in addition to adsorption. Please refer to Response #5.

Comment 46: Figure 4, Explanation No. 3: The plan refers to the soil as "grossly contaminated." BNSF would prefer that the plan consistently use the commonly accepted term of "visibly contaminated" as is used on Page 10, Number 3.

Response 46: The plan refers to removal of grossly contaminated soils. Grossly contaminated soil in some situations may apply to soils that are not "visibly" contaminated, but contain significant quantities of contaminants. Since only "visibly" contaminated soils were removed, the term "grossly" will be changed to "visibly" contaminated soil in the ROD. The ROD requires an evaluation of confirmation samples to confirm cleanup levels have been achieved. If cleanup levels are not achieved, additional measure will be taken consistent with the remedy.

Comment 47: Page 8, 3rd Paragraph, Site Background, Hydrocarbons (Diesel Fuel): Remedial investigations conducted in the depot area did not reveal any free product. Therefore, no further investigations or remediation is warranted in this area.

Response 47: During the diesel fuel sheen investigation, free product was detected in monitoring well LG-11 on Main Street south of the depot area. This area was ignored during the investigation. Additional diesel fuel recovery, bioventing and monitoring wells may need to be installed in this area to identify and delineate free product. If free product or residual diesel fuel is discovered in this area, recovery wells and/or bioventing wells will be installed. Even if free product is no longer detected in the depot area, dissolved phase petroleum was detected in this area and will require monitoring for natural attenuation to ensure the dissolved phase petroleum achieves cleanup levels.

Comment 48: Page 8, 6th Paragraph, Site Background, Air: The paragraph should state that based on sampling during remedial activities, outdoor air was not impacted by the site.

Response 48: Please refer to Response #42.

Comment 49: Page 12, 5th Paragraph, Summary of Site Risks, Human Health Risks: The first sentence should read, "Drinking contaminated groundwater poses the greatest potential human health threat at the BNSF Livingston site, where more than 90 percent of the total estimated risk is potentially associated with actually drinking contaminated groundwater, . . ."

Response 49: DEQ has clarified that estimated risks for drinking contaminated groundwater are potential risks.

Comment 50: Page 14, Summary of Site Risks, 2) For Diesel Fuel: The language used to describe the volume and to define "free product" in this section is misleading. This section should make clear that only a very small percentage of the total volume of diesel fuel cited in Paragraph 1, page 8, is potentially recoverable.

Response 50: Please refer to Response #5 regarding free product.

Comment 51: Page 14, Summary of Site Risks, 2) For Diesel Fuel, paragraph one: The plan states that it will require cleanup of the "free product" to the "maximum extent practicable." BNSF does not agree that the federal or state underground storage tank (UST) regulations are applicable or well-suited. The controlling requirements are found in CECRA at §75-10-721, MCA.

Response 51: DEQ agrees that the controlling requirements are found in §75-10-721, MCA as amended in 1991. Pursuant to §75-10-721(1), MCA "A remedial action…must attain a degree of cleanup of the hazardous or deleterious substance and control of a threatened release or further release of that substance that assures protection of public health, safety, and welfare and ***of the environment*** (emphasis added). Under CECRA, protection of the environment includes protection of groundwater.

In addition, pursuant to §75-10-721(2)(a) and (b), MCA (1993), DEQ "shall require cleanup consistent with applicable state or federal environmental requirements, criteria or limitations" and "shall consider and may require cleanup consistent with substantive state or federal environmental requirements, criteria, or limitations that are well suited to the site conditions." Please refer to Response# 82(A) for a more detailed response.

Comment 52: Page 14, Summary of Site Risks, 2) For Diesel Fuel, paragraph two: The development of the "1/8 inch or less" criteria as a "free product" cleanup level is unrelated to risk reduction. No public health risks or completed exposure pathways for diesel "free product" are identified in the proposed plan. As the establishment of this criteria falls within the definition of a rule under Montana's Administrative Procedures Act (MAPA), this criteria can only be required if established via notice and comment rulemaking. Any application of the 1/8 inch or less criteria is arbitrary and without statutory or regulatory basis.

Response 52: Please refer to Response #83 regarding rulemaking and Response #61 regarding risks from petroleum.

Comment 53: Page 14, Summary of Site Risks, 2) For Diesel Fuel, paragraph three: BNSF requests DEQ's answers to the following questions. Is any risk reduction effected by removing "free product"? Does the cleanup level distinguish between whether the free product plume is spreading or stabilizing/shrinking?

Response 53: Please refer to Response #61 regarding petroleum risk; Response #5 and Response #7 regarding free product. The diesel plume is currently located some distance from the original refueling area where diesel fuel tanks leaked and spills occurred. This indicates the free product has moved in the past and may migrate further in the future. The cleanup level does not distinguish between whether the free product plume is spreading or stabilizing/shrinking.

The spreading of the free product plume is prohibited by the State's nondegradation standard; therefore the remedy does not allow spreading of any of the contaminated plumes at the facility. In addition, EPA's MNA guidance does not allow use of MNA in an expanding plume; MNA

following source removal is the selected remedy for petroleum in groundwater. However, this is a separate requirement from the clean up level for existing free product. That level is based on both protection of the environment and compliance with ERCLs.

Comment 54: Page 14, Table 1: Cleanup Levels: In footnote 1, the plan provides that, "the standards are equivalent except the federal standard for chlorobenzene in groundwater is less stringent (100 µg/L) than the state standard (20 µg/L)." The establishment of this more restrictive standard is seemingly in conflict with §75-5-309, MCA, which provides that state standards be no more stringent than federal standards unless the Board of Environmental Review makes certain written findings.

Response 54: DEQ has identified both federal and state water quality standards as applicable to the cleanup. In the ROD the cleanup levels were revised to reflect the most recent state water quality standards; chlorobenzene is one contaminant whose standard was revised so that it is no longer more restrictive. The state water quality standards were adopted following the appropriate procedures.

Comment 55: Page 15, Summary and Evaluation of Alternatives, No. 2: The plan states "compliance with environmental requirements, criteria and limitations addresses whether an alternative will comply with applicable and relevant federal and state environmental laws and regulations." However, the selection of applicable, relevant or well suited requirements falls within the definition of a rule under MAPA; thus, these requirements can only be applied or enforced if established via notice and comment rulemaking pursuant to MAPA. DEQ has failed to comply with MAPA in selecting applicable, relevant, or well suited laws or regulations.

Response 55: Please refer to Response #83.

Comment 56: Page 18, 4th Paragraph, Soil and Groundwater Alternatives, Alternative 2: BNSF has fenced the cinder pile. In addition, BNSF will sample the cinder pile and work with DEQ to identify an appropriate remedy for the cinder pile. Depending on the analytical results potential remedies may include capping and re-contouring the cinder pile.

Response 56: Please refer to Response #7 and Response #23 regarding the cinder pile.

Comment 57: Page 22, Evaluation of Soil and Groundwater Alternatives, 2) Compliance with ERCLs:

See Comment 18 above. ***This refers to DEQ's renumbered comment 55 above.***

Response 57: Please refer to Response #55.

Comment 58: Page 24, Diesel Fuel Alternatives, Alternative A. No Action: As used in the plan, does the term "natural degradation" mean: (1) the time that it will take to deplete essentially all soluble constituents from the diesel fuel, (2) the time it will take for product thickness in all monitoring wells to diminish to 1/8 inch or less, or (3) the time it will take to degrade all distinct (separate)-phase petroleum products in the formation?

The plan's analysis is flawed. Since the plan does not identify any tangible threat to public health and the environment posed by "free product," why is the no action alternative "not expected to adequately protect public health and the environment?" With respect to long term effectiveness, the natural attenuation implicit in the no action alternative does result in reduction in toxicity, mobility, and volume of diesel fuel. Moreover, it is consistent with EPA's directive on MNA. OSWER Directive: 9200.4-17, November 18, 1997.

Response 58: See Response #61. Natural degradation is achieved, through time, when naturally occurring attenuation mechanisms, such as biodegradation, bring about a reduction in the total mass of hydrocarbon contamination for dissolved petroleum in groundwater and residual petroleum adsorbed to soil.

BNSF's comments show a misunderstanding of EPA's MNA guidance. DEQ has drawn upon EPA's Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action and Underground Storage Tank Sites, U.S. EPA, Office of Solid Waste and Emergency Response, Directive 9200.4-17P, (April, 1999) as guidance in its decision-making for petroleum-contaminated groundwater, both as free product and as dissolved. EPA does not provide support for the use of MNA to address free product in these circumstances:

> Control of source materials is the most effective means of ensuring the timely attainment of remediation objectives. EPA, therefore, expects that source control measures will be evaluated for all contaminated sites and that source control measures will be taken at most sites where practicable. At many sites it will be appropriate to implement source control measures during the initial stages of site remediation ("phased remedial approach"), while collecting additional data to determine the most appropriate groundwater remedy.

Directive 9200.4-17P, p.22.

EPA does not consider MNA to be a "presumptive" remedy, it is merely one option that should be evaluated with other applicable remedies. MNA should be selected only where it meets all relevant remedy selection criteria, where it will be fully protective of human health and the environment, and where it will meet cleanup levels with a time frame that is reasonable compared to that offered by other methods. The term natural degradation refers to the reliance on natural attenuation processes to achieve site-specific remedial objectives within a time frame that is reasonable compared to that offered by other more active methods (Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action and UST sites, U.S. EPA, Office of Solid Waste and Emergency Response, Directive 9200.4-17, November, 1997). Although in Table 4 on page 27 of the proposed plan, for purposes of comparison, DEQ used six years to estimate the cost of DEQ's preferred remedy for diesel fuel, DEQ believes it may actually take up to 20 years or more to complete diesel fuel recovery. The no action alternative is not expected to protect public health and the environment within a reasonable time frame (DEQ has estimated without free product removal it would take more than 100 years to naturally degrade diesel fuel).

Comment 59: Page 24, Diesel Fuel Alternatives, Alternative B, Intrinsic Bioremediation and Institutional Controls: See comment 21, above. ***This refers to DEQ's renumbered comment 58.*** DEQ fails to provide the legal basis for its rejection of Alternative B, based on not removing the volume of diesel fuel on groundwater within an "acceptable time." The plan fails to articulate or provide the authority for establishing an "acceptable time."

Response 59: Please refer to Response #58 (above) regarding the length of time needed to achieve cleanup levels with Modified Alternative F. Since Alternative B does not incorporate any free product recovery, DEQ estimated it would take more than 100 years to degrade the diesel fuel using intrinsic bioremediation.

For free product recovery as well as other remediation issues, DEQ has relied on the State and federal ERCLs. DEQ has relied on certain EPA Documents such as, "Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action and Underground Storage Tank Sites," U.S. EPA, Office of Solid Waste and Emergency Response, Directive 9200.4-17P, (April, 1999) as guidance in determining compliance with federal ERCLs.

The cited EPA guidance sets forth when natural attenuation is an appropriate alternative for corrective action under the Underground Storage Tank program. It is this guidance, as well as the Superfund regulations, which speak of "a reasonable time." For instance, the natural attenuation guidance states, "EPA expects that [MNA] will be an appropriate remediation method only where its use will be protective of human health and the environment and it will be capable of achieving site-specific remediation objectives within a time frame that is reasonable compared to the other alternatives." This statement supports DEQ's assertion that once free product is removed to the maximum extent practicable, the use of natural attenuation for the residual diesel complies with ERCLs and is an acceptable remedy.

As discussed in the ROD, Alternative B fails to meet the two primary selection criteria. It is not expected to provide adequate protection of human health and the environment because diesel fuel would remain on top of the groundwater. It would not comply with ERCLs because no attempt would be made to recover free product. Some of the alternatives are more effective in the long-term and reduce toxicity, mobility and volume better than Alternative B. Alternative B meets the short-term effectiveness criteria; it is implementable and it is less costly than some other alternatives. However, the costs do not include monitoring for a minimum of 100 years, which DEQ estimates as the length of time that would actually be needed to complete cleanup using Alternative B.

The determination of a reasonable timeframe is specific to each site. Each of the petroleum alteratives, with the exception of no action, rely on MNA as a component of the remedy. DEQ drew upon the NCP and MNA guidance in its determination on what would be reasonable time to allow source removal/MNA remedial action as opposed to more active forms of groundwater treatment. For a remedy relying on natural attenuation, EPA generally views a "...timeframe comparable to that which could be achieved through active restoration." [MNA guidance, p. 19.] as reasonable.

DEQ's selected remedy, using assumptions consistently applied for each alternative considered,

would cleanup the groundwater in timeframes similar to the most active alternative (six years vs. three). Alternative B, preferred by the commenter, would require cleanup to take an order of magnitude longer (twenty years vs. three years) if using assumptions consistently applied for each alternative considered. Evaluating the alternatives on this bases alone, Alternative B fails to return groundwater to its beneficial uses within a timeframe that is reasonable given the particular circumstances of the site.

Comment 60: Page 26, Diesel Fuel Alternatives, Alternative F, Bioventing and Passive Recovery: The plan states, "the conceptual use of bioventing to remove diesel fuel inappropriately assumes biodegradation occurs within diesel fuel when present as floating product." This seemingly refers to this assumption being made in the Feasibility Study ("FS"). However, the FS does not state that "biodegradation occurs within diesel fuel when present as floating product." The venting described in Alternative F will deplete "floating product" over time; however, it does not primarily rely on delivering oxygen to soil water with the zone containing the highest percentage contents of product in soil pores. It is true that the alternative seeks to take advantage of air-to-water contact in smear zone soil pores to deliver oxygen to microorganisms that degrade hydrocarbons in aqueous solution (i.e., dissolved in soil water). Reductions in "free product" volume will occur through organic phase to aqueous phase partitioning of hydrocarbons followed by aerobic degradation. Non-aqueous phase liquid (NAPL) hydrocarbon is present in soil pores as a three-phase system (i.e., air, water, product) even where "floating product" is present (although the percentage of air may be negligible in the zone of highest product saturation). As the water table fluctuates seasonally, "floating product" will be diminished as mobile "floating" NAPL is pushed up into the smear zone (where renewed capacity to retain this NAPL has been created by aerobic degradation of a portion of the hydrocarbons previously present). Through water table fluctuations over time, oxygen will contact the product present in all of the soil pores. If this were not the case, "floating product" would remain on the water table at fuel release sites indefinitely, and monitoring of natural attenuation sites demonstrate that is not the case. Since the stated objective of the plan is reduction in toxicity, mobility, and volume, the plan should explain why venting, which achieves all three of these criteria, is "not acceptable technology."

The plan's basis for whether this approach meets the ERCLs appears to hinge on removal to the maximum extent practicable." The interpretation of the term "removal" appears to be inconsistent with the intent of the RCRA regulatory language as interpreted by the U.S. Environmental Protection Agency (EPA). EPA did not, apparently, intend to preclude the use of in situ bioremediation as an acceptable means of "removing" "free product". EPA has issued Records of Decision where bioventing has been used to address "floating product" in lieu of any physical product removal (e.g. Eielson Air Force Base, Alaska). The apparent rejection as "unacceptable" of one of the best available technologies for remediation of "free product" needs to be reconsidered, particularly in light of EPA's acceptance of in situ aerobic degradation of "free product" and available research (see attached article entitled "Estimation of Biodegradation Rates Using Respiration Tests During In Situ Bioremediation of Weathered Diesel NAPL," Spring 1998 issue of *Ground Water Monitoring and Remediation).*

Response 60: Please refer to Response #58 regarding reasonable timeframes for MNA.

DEQ agrees that bioventing will remove or degrade NAPL coexisting with air and water in the soil pores in the vadose zone. It is for this reason that the ROD mandates bioventing to remediate fringe areas of the free product plume. However, without removal of the mobile free product source (passive recovery), the process described in this comment will not remediate free product in a reasonable timeframe. As described in the comment, petroleum compounds can only be biodegraded when they are dissolved in pore water. The limited amount of pore water available in the smear zone soil pores, coupled with the low solubilities of the residual diesel fuel compounds, drastically limits the rate at which contaminant mass can be removed from the floating free product.

Phase I of the selected remedy locates most of the passive recovery wells within the thickest part of the plume and most of the bioventing wells on the perimeter, or fringe area of the plume. Passive recovery in the thickest portion and bioventing on the fringe areas of the plume are appropriate applications for these two technologies.

There seems to be a misunderstanding about the evaluation of Alternative F and Modified Alternative F. Test Cell 1 successfully recovered diesel fuel at a rate of 1.7 gallons/day (assuming a 20-foot radius of influence) in a four-month period. The biodegradation test indicated 9.6 gallons/day of diesel fuel were degraded within a 150-foot radius of influence. Using a 20-foot radius of influence, biodegradation would remove diesel fuel at a rate of 0.17 gallons/day. Therefore, passive recovery is 10 times faster at removing diesel fuel than bioventing.

The commenter indicates that EPA has issued numerous RODs where bioventing has been used to address free product in lieu of physical product removal and cites one instance (Eielson Air Force Base, Alaska). DEQ disagrees with this characterization and also believes that Eielson Air Force Base is an isolated site with characteristics not comparable to LRY. The selected remedy in the 1994 ROD does not solely rely on bioventing to address floating product; it includes a passive skimming system similar to that proposed by DEQ for the LRY. Also, the bioventing system described in the Eielson ROD is a combination bioventing system and soil vapor extraction (SVE) system. An SVE removes contaminants from the subsurface through volatilization, which is a much more robust and effective process than bioventing. SVE is appropriate at Eielson because the primary contaminant is Jet Propulsion Fuel #4 (JP4), which is a light-end military jet fuel that is highly volatile and more closely related to gasoline than to diesel. An SVE system, which is appropriate for volatizing JP4, is not effective on weathered diesel, and was never proposed as a potential technology in the FS for diesel fuel.

The attached article entitled "Estimation of Biodegradation Rates Using Respiration Tests During In Situ Bioremediation of Weathered Diesel NAPL," Spring 1998 issue of *Ground Water Monitoring and Remediation* does not discuss bioventing in the context of removing mobile free product. It refers to remediating NAPL that coexists in soil pore spaces with air and water, not mobile NAPL (or free product defined above) similar to what exists at LRY. Also, the study achieved degradation of NAPL through bioventing coupled with depressing the water table up to 4 meters. However, depression of the water table, or "active free product recovery" as described in the FS is not advocated by the commenter. The article may be useful as a reference in designing methods of measuring degradation rates achieved in the fringe areas of the plume

where bioventing will be utilized.

Comment 61: Page 26, Diesel Fuel Alternatives, Modified Alternative F, Expanded Passive Recovery, Monitoring and Bioventing, paragraphs one and two: The plan provides that DEQ "would determine if residual diesel fuel would require additional evaluation and remediation." Residual diesel at the water table was assigned no risk in the risk assessment and has no regulatory drivers to require remediation. Therefore, it should not be considered for remediation.

BNSF concurs with the use of bioventing (bio-venting or bio-remediation) for remediation of "free product"; however, the proposed plan only mentions "enhanced biodegradation of residual diesel fuel adsorbed to soil." Because the cleanup levels for diesel fuel do not address "residual diesel fuel adsorbed to soil," there is no need for bioventing. In fact, the proposed plan states, "little or no free product remains in this area," implying that the cleanup level (i.e., 1/8 inch) has already been met.

Response 61: The BRA did not identify petroleum as a risk because at the time the BRA was conducted there was not an established procedure by which to quantitatively evaluate risk from petroleum. There has been considerable development in recent years regarding the risk posed by petroleum contamination in soils and groundwater. DEQ developed Risk-Based Corrective Action (RBCA) Tier I guidance that identifies screening levels for petroleum fractions and compounds in soil and groundwater. The screening levels consider risk to human health and leaching from soil to groundwater. At certain levels, petroleum in soil and groundwater does present an unacceptable risk to human health. In addition, the selected remedy must be protective of human health, safety, welfare and ***of the environment*** (emphasis added). DEQ interprets this to include protection of groundwater. The ROD identifies cleanup levels for petroleum in soil and groundwater. The majority of these are based on attainment of the State's groundwater standards. Please refer to Response #5 regarding the ineffectiveness of bioventing in treating free product.

Comment 62: Page 26, Diesel Fuel Alternatives, Modified Alternative F, Expanded Passive Recovery, Monitoring and Bioventing, paragraph three: Are "concentrations of diesel fuel constituents in groundwater" being addressed by the proposed plan? There is no indication in the RI, FS, Baseline Risk Assessment, or proposed plan indicating that "concentrations of diesel fuel constituents in ground water" pose any risk either to human health or the environment or that dissolved hydrocarbons cleanup levels have been established or exceeded for the site. None of the diesel fuel constituents were selected as chemicals of concern in the risk assessment.

Response 62: Please refer to Response #61.

Comment 63: Page 26, Diesel Fuel Alternatives, Modified Alternative F, Expanded Passive Recovery, Monitoring and Bioventing, paragraph four: The plan fails to articulate how the ten (10) year time frame established for bioventing was determined. This time frame is much longer than the typical bioventing time frame to address residual product in soil.

Response 63: The number of years to complete alternatives A through F were provided by BNSF and are based on different assumptions than DEQ's on the volume of diesel fuel remaining and the volume of diesel fuel that needs to be removed. DEQ believes the number of years to complete the remedy is underestimated. Actual years to perform diesel fuel passive recovery and bioventing will be based on the documented performance of the recovery system. However, consistent with FS guidance and MNA guidance, assumptions were consistently applied for each alternative considered.

DEQ's remedy includes initiating bioventing in appropriate areas in Phase I, with additional bioventing wells being added during Phase II in areas where free-product is removed to the "maximum extent practicable." DEQ estimated that Phase I may take approximately 10 years for bioventing to show reductions in residual petroleum. Phase I will include soil sampling and respiration tests and possibly other methods to evaluate the effectiveness of bioventing. Once petroleum constituents in groundwater reach cleanup levels, DEQ will re-evaluate the need to continue bioventing of residual petroleum in subsurface soils, which will include an evaluation of confirmation soil samples at depths that might be encountered by construction workers.

Comment 64: Page 28, Evaluation of Diesel Fuel Alternatives, No. 1, Overall Protection of Public Health and the Environment: This evaluation incorrectly portrays the comparison of overall protectiveness of public health and the environment. Since the "free product" at the Livingston site poses no tangible threat to human health or to the environment, the alternatives are all essentially equivalent in this regard. Also, diesel fuel will "remain on top of the groundwater" under all of the alternatives, the only potential difference among the alternatives being the time frame during which product may enter monitoring wells and be measured.

Response 64: This comment assumes petroleum poses no risk to human health and the environment. Please refer to Response #61. Therefore, DEQ's evaluation of overall protectiveness is correct. BNSF states diesel fuel will remain after remediation efforts have stopped. While there may be limited pockets of free product that remain within the plume, it is expected to naturally attenuate. Since the volume will be reduced by passive recovery and bioventing, the time for attenuation will be reduced. Reducing the time to cleanup diesel fuel is desirable.

Comment 65: Page 28, Evaluation of Diesel Fuel Alternatives, No. 2. Compliance with ERCLs: See Comment No. 18, above. ***This refers to DEQ's renumbered comment 55***. Alternative F appears to address roughly the same area as Modified Alternative F. The operative word in this analysis appears to be "recovery." Does the plan imply that recovery (which involves potential human exposures while extracting, separating, transporting, re-refining, and burning fuel) is required to the exclusion of a remedial technology that destroys/detoxifies the same fuel in situ?

Response 65: The difference is time to complete the remediation. Please refer to Response #60. BNSF states that the operative word is recovery. This is correct. As stated in Response #60, the rate of passive recovery is ten times the rate of biodegradation. Both technologies have application at this site. Recovery is applicable in the center of the diesel plume and bioventing is applicable at the edges of the plume, where recovery would be slow.

Comment 66: Page 28, Evaluation of Diesel Fuel Alternatives, No. 3. Long-term Effectiveness and Permanence: The statement that "Alternatives A, B, and E would not be as effective over the long term compared to Alternatives C, D, and Modified Alternative F" lacks any technical basis. See Comment No. 25 above. ***This refers to DEQ's renumbered comment # 64.***

Response 66: The commenter is implying that eventually all contamination is remediated naturally, even under the no action alternative. However, this is not what is contemplated by either CECRA or CERCLA. The statement is made in comparison to the other alternatives. Long-term effectiveness and permanence refers to the ability of an alternative to maintain reliable protection of human health and the environment over time. By actively removing free product, the three alternatives offer substantially more long-term effectiveness and permanence than the other remedies suggested by the commenter (including no action, ICs, and limited area recovery), which do not actively remove the source of contamination to soils and groundwater.

Comment 67: Page 28, Evaluation of Diesel Fuel Alternatives, No. 4. Reduction in Toxicity, Mobility and Volume: The plan fails to provide any scientific or technical basis for the implication that the physical removal of a relatively small amount of "free product" is somehow superior in reducing toxicity, mobility, and volume to the in situ degradation of a large mass of more soluble hydrocarbon.

Response 67: The primary reasons for requiring free product removal at the site are based on legal requirements, the importance of source control prior to implementing natural attenuation, the immediate risk to the environment and the potential public health, safety, and welfare concerns posed by the constituents of free product and loss of beneficial uses posed by free product.

The physical removal of free product reduces the toxicity, mobility and volume of petroleum. In situ degradation will not reduce toxicity, mobility, and volume of free product in comparision to all the alternatives but the no action alternative; it would reduce toxicity, mobility, and volume of residual petroleum after free product is removed. Please refer to Response #60 regarding the effectiveness of in situ degradation at removing free product.

Removal of free product through passive remediation will fulfill the criteria for volume reduction better and more effectively than natural attenuation alone. Response #60 gives scientific basis for this position. According to pilot tests data interpretation, bioventing with forced exchange of oxygen is ten times slower and therefore less effective than passive recovery. Therefore, natural attenuation would be much slower than bioventing, as natural oxygen exchange in the soil is slower than the forced exchange of oxygen. With natural attenuation we can assume a period of 100 years or more before any observable volume decreases occur.

Comment 68: Page 28, Evaluation of Diesel Fuel Alternatives, No. 5, Short-term Effectiveness: This section should include a discussion addressing worker safety during the operation of the remedial systems.

Response 68: DEQ considered worker safety during implementation and operation of the remedy. Please refer to Section IX "Summary of Comparative Analysis of Alternatives" in the ROD.

Comment 69: Page 30, Scope of Preferred Remedy: The plan's cost-effective determination appears to be flawed, as less costly remedies will afford the same degree of protectiveness to human health and the environment with substantially less short-term risk.

Response 69: The determination is not flawed. The FS simply stated the estimated cost of each alternative. DEQ is not required to just compare cost-effectiveness with short-term risk to human health. DEQ considered the costs, the degree of overall protectiveness of human health and of the environment (including short-term risk), and other benefits of the evaluated alternatives. In the proposed plan Table 2, Comparison of Alternatives Using Eight Criteria, identifies only Alternatives C and D equal to Modified F in Overall Protection of Public Health and the Environment. Alternative D had a lower cost rating; however, the FS states that pumping groundwater would merely smear free product into previously uncontaminated alluvium and prevent recovery and also contribute to the mobility of VOCs. All three alternatives have poor short-term effectiveness ratings. Please refer to Response #3 and Response #68 regarding worker safety.

Comment 70: Page 32, The Preferred Remedy, I. Source Removal: BNSF agrees to proceed with the source control work outlined in the Proposed Plan. In fact, BNSF will be submitting for DEQ's review and approval a work plan for the electric shop portion of the excavation work. BNSF believes that the electric shop work plan can be implemented as an Interim Action under the Modified Partial Consent Decree (December 1989). BNSF will treat, with lime/SVE process, the soil exhibiting a hazardous characteristic to meet the land disposal restrictions, if disposed on land.

Response 70: In addition to exhibiting hazardous characteristics, DEQ has determined the soil at the electric shop contains a listed hazardous waste. Please refer to the ERCLs in Appendix A.

Comment 71: Page 33, The Preferred Remedy, II. Groundwater: BNSF agrees to work with DEQ, Park County, and the city of Livingston to implement the institutional controls related to the use of groundwater at the facility. In addition, BNSF agrees to develop a groundwater sampling schedule with DEQ to monitor remediation efforts.

Response 71: Please refer to Responses #35(B).

Comment 72: Page 33, The Preferred Remedy, III. Diesel Fuel, paragraph one: What is the basis for he[sic] plan's well spacing and configuration design?

Response 72: The well spacings given in the plan for both passive recovery and bioventing wells are based on pilot testing completed at the site. The radius of influences used were 20 feet for passive recovery wells and 150 feet for bioventing wells. DEQ does not anticipate, however, that wells will be installed every 20 feet. The well field configuration considers ease of well

installation and placement of utility corridors. Removing more of track four creates a corridor through the center of the plume.

Comment 73: Page 33, The Preferred Remedy, III. Diesel Fuel, paragraph two: BNSF agrees to proceed with additional "free product" recovery, although BNSF believes that a different approach from the one called for in the Proposed Plan would be even better suited to achieving DEQ and BNSF's goals for remediating the "free product". BNSF would like to work with DEQ to formulate an alternative design as provided for on page 34, in the last paragraph of The Preferred Remedy, III. Diesel Fuel, section.

Response 73: Based on the RI and FS, DEQ has formulated an appropriate phased hydrocarbon recovery system. BNSF may propose additional free product recovery designs be included as part of Phase I remedial design in order to evaluate further systems. Effective well placement, construction, design and operation will lead to successful free product recovery.

Comment 74: Page 33, The Preferred Remedy, III. Diesel Fuel, paragraph three: BNSF, for safety reasons, is opposed to drilling through the tunnel beneath the tracks or having workers conduct remediation activities in the tunnel. The basis for this opposition is that BNSF believes that significant risk to workers safety would result in drilling through the tunnel and placing workers in a confined area where there potentially could be hydrocarbon fumes.

Response 74: Comment 33: Please refer to Response #3, Response #7, and Response #35(C) regarding worker safety and the MRL Tunnel. DEQ is confused by BNSF's concern about workers' exposure to hydrocarbon fumes, since the commenter's earlier comments indicate it does not believe that free product or hydrocarbon contamination poses a human health risk at the site.

Comment 75: Page 33, The Preferred Remedy, III. Diesel Fuel, paragraph four: Although, BNSF agrees to proceed with additional recovery efforts, BNSF is reluctant to install wells within the active portions of the railyard. BNSF believes that, given the lack of risk posed by the plume to the public, exposing remediation workers, Livingston Rebuild Center workers, and Montana Rail Link personnel to continuously high risk work situation is inconsistent with the goals of decreasing the overall risk at the facility. In addition, given the minimal risk posed by the "free product," the plan's evaluation of cost-effectiveness is inadequate and does not comply with § 75-10-721, MCA.

Response 75: Please refer to Response #3, Response #7, and Response #35(C) regarding worker safety and the MRL Tunnel. DEQ believes MRL and Talgo-LRC, in conjunction with BNSF and its contractors, can implement and maintain a safe diesel fuel recovery system.

Comment 76: Page 34, The Preferred Remedy, IV. Asbestos, paragraph one: BNSF has fenced the cinder pile. BNSF will sample the surface soils of the cinder pile, and work with DEQ to identify an appropriate remedy for the cinder pile. Such remedy may include capping and/or re-contouring the cinder pile.

Response 76: Please refer to Response #7 and Response #23 regarding the cinder pile. DEQ has determined that additional sampling of the cinder pile will not be necessary, since all the previous VOC data indicate that the cinder pile soils meet cleanup levels.

Comment 77: Page 34, The Preferred Remedy, IV. Asbestos, paragraph two: The plan should point out that air samples collected downwind from the cinder pile during the Remedial Investigation did not show asbestos migrating from the pile, or reveal any problems associated with any migration of asbestos from the pile.

Response 77: Envirocon obtained 14 samples at the cinder pile as part of the surficial soil sampling event. None of the samples showed asbestos to be present; however, DEQ obtained samples of three waste materials on the cinder pile, which contained asbestos. The ROD provides information about the potential risk from asbestos in the cinder pile. Please refer to Response # 7 regarding the cinder pile.

Comment 78: Page 34, The Preferred Remedy, V. Sampling: BNSF agrees to sample indoor air as requested. However, as noted above in the general comments, and as identified in earlier indoor air sampling, it is very difficult to attribute the presence of contaminants to the Livingston Railyard. This is due to the difficulty in distinguishing between background contaminants and contaminants coming from the site.

Response 78: An important part of any indoor air sampling program includes evaluating ambient air and conducting detailed surveys with the homeowner prior to and during the sampling event. Information in surveys and ambient air data provide information about potential solvents present in household products and assists in separating background contaminants present in homes from contaminants at the site. The consent decree scope of work and subsequent work plan for indoor air sampling will address this issue.

Comment 79: Page 36, Evaluation of Preferred Remedy for Diesel Fuel, paragraph one:
The proposed plan does not identify the threats to public health and the environment for which the preferred remedy affords protection. The "floating product" is apparently immobile, is not causing groundwater or surface water contamination requiring separate actions, and is separated from potential contact by a thick unsaturated soil covering.

Response 79: DEQ disagrees with the statement that floating product is apparently immobile, not causing groundwater or surface water contamination requiring separate actions. Data in the RI shows diesel fuel has migrated from the predominant spill release area (refueling area with underground storage tanks and along track 11) and TPH and TPH chemical constituents are detected in groundwater, especially in wells along Park Street. Please refer to Response #61 regarding petroleum risk.

Comment 80: Page 36, Evaluation of Preferred Remedy for Diesel Fuel, paragraph two:
Operation and maintenance of recovery systems between active tracks poses a very real and tangible worker hazard that should be compared to the incremental risk reduction, if any, afforded by the installation and operation of such recovery systems. It is not worth incurring a

substantial risk of a serious worker injury or fatality to remove product that poses no significant risk to human health or to the environment.

Response 80: As previously stated, BNSF's contractor has demonstrated diesel fuel recovery systems can be installed, operated and maintained within the active railyard without worker injury, provided careful planning, coordination and communication are a priority. Please refer to Response #3 and Response #7 regarding worker safety and the MRL Tunnel.

Comment 81: Page 37, Glossary, Free Product: The plan defines free product as "diesel fuel floating on top of the groundwater." This definition is confusing and not technically based. Free product should be by its common technical definition, which defines free product as "product that will drain under the influence of gravity into a well."

Response 81: Defining free product as "product that will drain under the influence of gravity into a well" implies free product is only recoverable if gravity forces it into a well. Under this definition free product will not be recovered unless it enters a well by gravity. Utilizing vacuum enhanced free product recovery, free product can also enter a well by applying a vacuum on the well. Therefore, free product can also enter a well under a vacuum and be recovered. DEQ will use EPA's definition of free product: "Immiscible liquid phase hydrocarbon existing in the subsurface with a positive pressure such that it can flow into a well." Please refer to Response #35(C) regarding the definition of free product.

3.9 Comments from Envirocon, Inc.

Comment 82(A): The federal regulation relied upon by DEQ to require cleanup of free product to the maximum extent practicable is superseded by Montana regulations which do not contain that standard.

DEQ states that it "will require cleanup of the free product to the maximum extent practicable. This requirement is, in part, from a federal regulation which requires removal of free product to the maximum extent practicable as determined by the implementing agency." (Proposed Plan, 14.) By this reference DEQ is apparently referring to 40 CFR 280.64. However, in Montana this regulation has been superseded and DEQ's reliance on the regulation is misplaced and inappropriate.

Under RCRA a state can develop its own petroleum UST program and seek approval from EPA to exercise primary responsibility in regulating USTs. Once the state obtains approval, the state plan will govern in lieu of the federal program. 325-343 E. 56th St. Corp. v. Mobil Oil Corp., 906 F. Supp. 699, 682 (D.D.C. 1995). Montana received final approval "to operate its underground storage tank program in lieu of the Federal program" on March 4, 1996 (61 Fed. Reg. 3599 (1996)). Accordingly, that standard is not applicable at this site.

Response 82(A): Whether a federal regulation is superseded by state regulation is not relevant to the analysis of whether the standard is an ERCL. Pursuant to § 75-10-721(2)(a) and (b), MCA (1993), DEQ "shall require cleanup consistent with applicable state or federal environmental requirements, criteria or limitations" and "shall consider and may require cleanup consistent with

substantive state or federal environmental requirements, criteria, or limitations that are well suited to the site conditions."[2]

DEQ disagrees with the commentor's statement that the UST standard is not applicable to the site. "Applicable" is defined in CERCLA regulations as, "those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, or contaminant, remedial action, location, or other circumstance found at a CERCLA site." The regulation, 40 CFR 280, applies to all owners and operators of an UST system except in certain instances not relevant here.[3] UST systems means "any one or combination of tanks (including underground pipes connected thereto) that is used to contain an accumulation of regulated substances, and the volume of which (including the volume of underground pipes connected thereto) is 10 percent or more beneath the surface of the ground."[4] The Administrative Record shows that the Livingston Facility contained UST systems at the effective date of the regulations, as is evident from UST orders issued by DHES in 1988. The site also presently contains UST systems. To the extent certain UST systems were removed prior to the effective date of the regulations, diesel is found separate and distinct from an UST system, or UST regulations are not applicable, the UST requirements remain well suited since they address situations or problems sufficiently similar to those at the site. As set forth above, DEQ must consider and may require compliance with well suited requirements.

Comment 82(B): Moreover, even if this regulation were appropriately applied at a site in Montana, it is unlikely that it would be construed and applied in the same manner as DEQ is proposing here. The context of the reference to maximum extent practicable in this regulation suggests that the standard is contemplated for initial response after confirmation of a release (40 CFR 280.61) through initial site characterization (40 CFR 280.63) and "while . . . preparing for actions required" under the investigations (40 CFR 280.65) and corrective action provisions (40 CFR 280.66) of the federal UST regulations.

Further, in its explanation of Modified Alternative F DEQ states: "This alternative would protect

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[2] When CECRA was amended during the 1995 legislative session, one of the revisions pertained to the development and selection of ERCLs. S*ee* i.e. Chapter 584, Laws of Montana, 1995. However, Section 15 of Chapter 584 stated that the 1995 revisions and amendments do not apply to civil actions commenced or begun prior to the effective date of the 1995 act. Since the complaint in State of Montana v. Burlington Northern, Inc., Burlington Northern Railroad Company and Glacier Park Company CV 88-141-H-CCL was filed December 27, 1988 and pertains to the Burlington Northern Livingston Railyard Site, and other Burlington Northern Facilities, these ERCLs comply with CECRA as amended in 1991, rather than CECRA as amended by Chapter 584, Laws of Montana, 1995.

[3] 40 CFR 280.10 (2000).

[4] 40 CFR 280.12 (2000).

public health and the environment and comply with the ERCLs because free product would be removed from groundwater to the maximum extent practicable." (Proposed Plan, 26.) However, the standard for approving a corrective action plan for responding to contaminated soils and ground water is found in a different federal regulation, 40 CFR 280.66. Under that regulation the standard for approval is that the "plan will adequately protect human health, safety, and the environment." (40 CFR 280.66(b)). Several of the proposed alternatives for free product removal satisfy this standard.

Response 82(B): DEQ believes that the removal of free product to the maximum extent practicable is applied throughout Subpart F of the UST regulations, entitled "Release Response and Corrective Action for UST systems Containing Petroleum or Hazardous Substances," culminating in corrective action. Even a cursory glance of Subpart F shows the importance of free product recovery: 40 CFR 280.65 requires investigations whenever "free product is found to need recovery in compliance with § 280.64" and 40 CFR 280.66 states the corrective action plan must have provisions for responding to contaminated soils and groundwater. The regulations allow the owner or operator to begin self-initiated cleanup, and they may, after fulfilling the requirements of 40 CFR 280.61 through 40 CFR 280.63, submit a corrective action plan responding to contaminated soil and groundwater (or the agency can require submittal of a plan). Removal of free product to the maximum extent practicable is part of the federal UST cleanup process in order to ensure adequate protection of public health, safety, and welfare and the environment.

For free product recovery as well as other remediation issues, DEQ has relied on the state and federal ERCLs. DEQ has considered certain EPA Documents such as "How to Effectively Recover Free Product At Leaking Underground Storage Tank Sites, A Guide for State Regulators" EPA 510-R-96-001 (September 1996) and "Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action and Underground Storage Tank Sites," U.S. EPA, Office of Solid Waste and Emergency Response, Directive 9200.4-17P (April, 1999) as guidance in determining compliance with the federal UST ERCLs. In "How to Effectively Recover Free Product At Leaking Underground Storage Tank Sites, A Guide for State Regulators," EPA states:

> The Federal regulations (40 CFR 280.64) state that at UST sites where investigations indicate the presence of free product, owners and operators must remove free product to the maximum extent practicable as determined by the implementing agency. Typically, the implementing agency is represented by the state environmental agency or local fire prevention office. Where the threat is imminent (*e.g*., seepage of free product into basements or parking garages) an appropriate response would be immediate emergency action to prevent explosion or fire. *Even where the consequences of the release are not immediately hazardous (e.g., contamination of groundwater resources) expeditious recovery of free product will contribute to minimizing the costs and time required for effective corrective action.*
>
> The decision-making process for determining the most appropriate corrective action is intended to develop a remedy to mitigate risks. Typically, the remedial approach is described in a corrective action plan (CAP) or other report along with

> target clean-up levels to be achieved in an appropriate period of time. The corrective action specified in the CAP may include a combination of alternative techniques (*e.g.*, bioremediation, soil vapor extraction [SVE]), traditional remedial methods (*e.g.*, free product recovery, excavation, pump-and-treat), institutional controls (*e.g*., deed restrictions), and natural attenuation. *At most sites where significant volumes of petroleum have reached the water table, free product recovery is the first step of the remedial approach.*

emphasis added.

The guidance, including the language cited here, as well as the UST regulations contained in Subpart F, show a clear intent to require cleanup of free product to the maximum extent practicable, throughout release response and corrective action.

In "Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action and Underground Storage Tank Sites," EPA sets forth when natural attenuation is an appropriate alternative for corrective action under the UST program. The natural attenuation guidance states, "EPA expects that [MNA] will be an appropriate remediation method only where its use will be protective of human health and the environment and it will be capable of achieving site-specific remediation objectives within a time frame that is reasonable compared to the other alternatives."

Under the heading "Petroleum-Related Contaminants," EPA writes:

> Natural attenuation processes, particularly biological degradation, are currently best documented at petroleum fuel spill sites. Under appropriate field conditions, the regulated compounds benzene, toluene, ethylbenzene, and xylene (BTEX) may naturally degrade through microbial activity and ultimately produce non-toxic end products (*e.g.*, carbon dioxide and water). Where microbial activity is sufficiently rapid, the dissolved BTEX contaminant plume may stabilize (*i.e.*, stop expanding), and contaminant concentrations in both groundwater and soil may eventually decrease to levels below regulatory standards. Following degradation of a dissolved BTEX plume, a residue consisting of heavier petroleum hydrocarbons of relatively low solubility and volatility will typically be left behind in the original source (spill) area. Although this residual contamination may have relatively low potential for further migration, it still may pose a threat to human health or the environment either from direct contact with soils in the source area or by continuing to slowly leach contaminants to groundwater. *For these reasons, [MNA] alone is generally not sufficient to remediate petroleum release sites. Implementation of source control measures in conjunction with [MNA] is almost always necessary.* Other controls (*e.g.*, institutional controls), in accordance with applicable state and federal requirements, may also be necessary to ensure protection of human health and the environment.

Page 7 (emphasis added).

In addition, leaving available free product on the groundwater does not provide protection

of the environment, nor does it comply with water quality ERCLs.

Comment 82(C): Additionally, 40 CFR 280.64 identifies the actions required by an owner: conduct free product removal in a manner that minimizes the spread of contamination; use abatement of free product migration as a minimum objective for the design of the free product removal system; and handle any flammable products in a safe manner. Each of these actions has been accomplished by the actions taken to date and the proposed Alternative F - Bioventing and passive recovery. First, monitoring shows that the free product removal has been conducted in a manner that minimizes the spread of contamination. Second, monitoring shows that the plume is not migrating. The free product recovery system in Alternative F meets this objective with significantly fewer risks associated with conducting actions in an active railyard than the proposed alternative. Third, the products have been handled in a safe manner and will be handled in a safe manner under each of the alternatives.

Response 82(C): The commenter has cited only portions of 40 CFR 280.64; 40 CFR 280.64 provides that where investigations in connection with an UST system reveals the presence of free product,[5] owners and operators must remove free product to the maximum extent practicable as determined by the implementing agency. This regulation requires that the free product removal be conducted in a manner that minimizes the spread of contamination into previously uncontaminated zones by using recovery and disposal techniques appropriate to the hydrogeologic conditions at the site, and that properly treats, discharges or disposes of recovery byproducts in compliance with applicable local, state and federal regulations. In addition, 40 CFR 280.61(a)(6) requires commencement of free product removal to begin as soon as practicable and in accordance with 40 CFR 280.64.

Abatement of free product migration is a minimum objective for the design of the free product removal system. In addition, any flammable products must be handled in a safe and competent manner to prevent fires or explosions. The Montana regulations regarding underground storage tanks include similar requirements set forth at ARM 17.56.602(3).

Comment 83: The DEQ cannot enforce a "policy" as a regulation unless the policy has gone through the rule-making process and been subject to the due process criteria contained in the Montana Administrative Procedure Act ("MAPA").

The DEQ has stated that it is relying upon a memorandum dated June 16, 1997, concerning the DEQ criteria for "remove free product to the maximum extent practicable." Under MAPA (M.C.A. 2-4-101 et seq.) the criteria that the DEQ is relying upon here would be defined as a rule because it is a standard "or statement of general applicability that implement, interprets, or prescribes law or policy . . ." (M.C.A. § 2-4-102(l 1). However, before a rule is enforceable, the proposed criteria must go through a notice, hearing, and public comment process detailed in M.C.A. § 2-4-302. "A rule is not valid unless notice of it is given and it is adopted in substantial compliance with § 2-4-302, 2-4-303, 2-4-306 and this section and unless notice of adoption of

[5] Free product investigations are required upon discovery of a release under both State and federal law. S*ee* 40 CFR 280.62(6) and ARM 17.56.602(3).

the rule is published within 6 months of the publishing of notice of the proposed rule." M.C.A. § 2-4-305(7). The DEQ criteria contained in the June 16, 1997, memorandum cannot be enforced as a mandatory obligation at the Livingston Shop Complex because it purports to interpret and prescribe a policy about a "maximum extent practicable" standard yet it is invalid as a rule because the DEQ has not complied with the notice, hearing, and public comment process prescribed by MAPA to ensure due process.

The DEQ states that: "This site is being cleaned up pursuant to Montana's Comprehensive Environmental Cleanup and Responsibility Act (CECRA)." (Proposed Plan, 15.) However, as discussed in the preceding paragraph, MAPA poses limitations on actions carried out under CECRA. And while DEQ interprets and implements CECRA through policy and actions, for all of the reasons identified in the preceding paragraph, these "de-facto" rules are not mandatory or enforceable because of the failure to subject them to proper rule-making under M.C.A. § 2-4-101, et seq.

Response 83: In developing this Record of Decision, DEQ did not rely on the referenced June 16, 1997, memorandum. DEQ relies instead on the ERCLs, including the Underground Storage Tanks and Water Quality standards as well as the requirement for the remedy to protect of public health, safety, and welfare and of the environment.

Maximum extent practicable: The removal to less than $^1/_8$ inch cleanup standard for free product is from two UST regulations. 40 CFR 280.64 (2000) provides that where investigations in connection with leaking underground storage tanks reveal the presence of free product, owners and operators must remove free product to the maximum extent practicable as determined by the implementing agency. 40 CFR 280.43 (2000) specifies groundwater monitoring requirements for underground storage tanks and and requires continuous monitoring devices or manual methods used to detect the presence of at least $^1/_8$ of an inch of free product on top of the groundwater in the monitoring wells. [6] Below this $^1/_8$ inch standard, State and federal regulations would not view a release in need of corrective action as occuring if undetected. *see* 53 Fed. Reg. 37082, 37123.

In order to meet water quality standards including groundwater standards and the prohibition on pollution of State waters, rely on MNA, and be protective of the environment, removal of free product to the maximum extent practicable is necessary.

Compliance with MAPA: However, even if this memorandum was used, DEQ is not attempting to enforce a policy as a regulation. A rule under MAPA is a standard "or statement of *general* applicability that implement, interprets, or prescribes law or policy…." A CECRA remedy applies to a specific facility and is based on an evaluation of site-specific criteria.

Section 2-3-101, MCA, states that:

> The legislature finds and declares pursuant to the mandate of Article II, section 8, of the 1972 Montana constitution that legislative guidelines should be established to secure to the people of Montana their constitutional right to be afforded

6 The State equivalent appears at ARM 17.56.407 (2001).

> reasonable opportunity to participate in the operation of governmental agencies prior to the final decision of the agency.

Even a cursory reading of CECRA shows that remedy selection is separate and distinct from the requirements of MAPA, although the two statutes share much of the same requirements for public involvement. Montana statutes are replete with mandates for public participation. MAPA and CECRA are two such statutes. Under CECRA, the legislature has established a statutory framework for remedy decisions in § 75-10-721, MCA, and a role for public participation in § 75-10-713, MCA.

Section 75-10-713, MCA, provides that before final approval of any administrative order on consent, judicial approval of a consent decree, or upon making a final decision regarding a proposed remedial action, order, or decree, DEQ must publish a notice and brief description of the proposed order, decree, or final decision action in a daily newspaper of general circulation in the area affected and make copies of the proposal available to the public for public comment. In addition, DEQ must notify the county commissioners and governing bodies of cities, towns, and consolidated local governments impacted by a proposed remedial action. Upon request of certain entities, DEQ must conduct a public meeting at or near the facility for the purpose of receiving verbal comment regarding the proposed order or decree; and consider and respond to relevant written or verbal comments properly submitted during the comment period or at the public meeting. In addition, the Administrative Record supporting DEQ's approved order or decree must contain DEQ's responsiveness summary. The breadth of public participation provided for in CECRA is functionally equivalent to that provided for in MAPA.

Further, in making the remedy selection criteria at this site, DEQ relied on implementation of ARM 17.56.505 (2001) which require implementation of corrective action measures, including free product removal, for spills and overfills, and ARM 17.56.602(3)(b)(2001), which requires owners and operators to use abatement of free product migration as a minimum objective for the design of the free product removal system and ARM 17.56.407 (2001). DEQ also relied on water quality regulations ARM 17.30.1006 and ARM 17.30.1011 in setting the free product standard. ARM 17.55.111 (2001), CECRA's facility ranking regulation, requires a maximum priority designation to a facility that exhibits the presence of free product in significant quantities in the groundwater. Promulgation of all these state regulations did comply with MAPA.

Comment 84: CERCLA does not apply to free-product removal.

The DEQ states that the "remedy selection will be consistent" with its reliance on the federal CERCLA. (Proposed Plan, 15.) The preferred remedy for diesel fuel recovery, however, is inconsistent with CERCLA. First, by its terms CERCLA only applies to hazardous substances. The term hazardous substance is defined by CERCLA to exclude petroleum. 42 U.S.C. § 9601(14) states in part: "The term (hazardous substance) does not include petroleum, including crude oil or any fraction thereof ..." Thus, CERCLA does not apply to the free-product.

Second, EPA Guidance for identifying applicable standards and requirements at CERCLA sites is the CERCLA Compliance with Other Laws Manual (OSWER Directive 9234.1-01). This manual lists "the laws and regulations that establish the universe of applicable or relevant and

appropriate requirements." While this manual identifies several RCRA regulations it does not include the federal underground storage tank regulation that the DEQ relies on to explain the "maximum extent practicable" standard. Thus, under EPA guidance for CERCLA the "maximum extent practicable" standard is not an applicable or relevant and appropriate requirement.

Response 84:

The proposed plan does not state that the remedy is selected under CERCLA, as implied by the commenter. The proposed plan states that CECRA is modeled after CERCLA and because of the similarity, CERCLA selection criteria were used, which are consistent with the FS criteria set forth in the consent decree.

EPA's CERCLA Compliance with Other Laws Manual does not focus on petroleum and underground storage regulations because of CERCLA's petroleum exclusion, set forth at 42 USC 9601(14). It would be nonsensical for EPA's CERCLA guidance to focus on an area that is not regulated under its statute. The manual identifies other RCRA regulations since CERCLA clearly applies to, among other RCRA substances, listed and characteristic hazardous wastes. The lack of citations to UST regulations in EPA CERCLA guidance has no bearing on whether the petroleum substances are regulated under state law.

As required by the Consent Decree, DEQ has selected the proper remedy for the Burlington Northern Livingston Complex through a ROD process, drawing upon CERCLA and NCP for guidance or as otherwise appropriate and upon consideration of the remedial investigation report and feasibility study report at the Facility.

The selected remedy complies with CECRA, as amended in 1991, which does not contain a similar petroleum exclusion as CERCLA. CECRA requires that a remedial action performed must attain a degree of cleanup of the hazardous or deleterious substance and control of a threatened release or further release of that substance that assures present and future protection of public health, safety, and welfare and of the environment. S*ee* § 75-10-721(1), MCA (1993). The definition of hazardous or deleterious substance specifically includes "any petroleum product." *See* § 75-10-701(6)(d), MCA (1993). The diesel found at the site clearly meets the definition of petroleum product as "'[p]etroleum product' includes gasoline, crude oil (except for crude oil at production facilities subject to regulation under Title 82), fuel oil, diesel oil or fuel, lubricating oil, oil sludge or refuse, and any other petroleum-related product or waste or fraction thereof that is liquid at standard conditions of temperature and pressure (60 degrees F and 14.7 pounds per square inch absolute)." Section 75-10-701(10), MCA (1993).

In approving or carrying out remedial actions, the department: (a) shall require cleanup consistent with applicable state or federal environmental requirements, criteria, or limitations; (b) shall consider and may require cleanup consistent with substantive state or federal environmental requirements, criteria, or limitations that are well-suited to the site conditions. *See* §§ 75-10-721(1)(2), MCA (1993). Therefore, the inclusion of ERCLs involving free product is warranted and required. In addition, the free product is a source to the groundwater (the environment); a remedy protective of human health and the environment must address this contamination source.

Comment 85: Removal of free product to the maximum extent practicable as interpreted and applied by the DEQ does not comply with the statutory requirement that cleanup be cost-effective.

DEQ states that "[t]his site is being cleaned up pursuant to Montana's Comprehensive Environmental Cleanup and Responsibility Act (CECRA)." The DEQ also states that it must "select and implement the remedy pursuant to CECRA as in effect in 1993." (Proposed Plan, 15.) The 1993 CECRA provision for remedy selections states in pertinent part:

> 75-10-721(2) In approving or carrying out remedial actions performed under this part, the department:
>
> (a) shall require cleanup consistent with applicable state or federal environmental requirements, criteria, or limitations;
>
> (b) shall consider and may require cleanup consistent with substantive state or federal environmental requirements, criteria, or limitations that are well-suited to the site conditions; and
>
> (c) shall select remedial actions that, at a minimum, protect public health, safety, and welfare and the environment and that:
>
> (i) use permanent solutions;
>
> (ii) use alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and
>
> (iii) are cost-effective, taking into account the total short-and long-term costs of the actions, including the cost of operation and maintenance activities for the entire period during which the activities will be required.

The statute mandates that the selected remedy be cost-effective and explains that all of the long and short term costs and operation and maintenance costs be considered in evaluating whether a proposal is cost-effective. The DEQ preferred remedy for diesel fuel recovery is the most expensive alternative considered by the DEQ, yet the DEQ does not offer any explanation of how this alternative complies with the statutory mandate that the selected remedy be cost-effective. Moreover, the DEQ did not consider all of the costs associated with the operations alterations that are necessitated by this proposal. Under the preferred remedy a recovery system would be installed amongst 18 active rail tracks which means (at a minimum) that additional workers are needed to address safety issues and that each task is more time consuming as it requires coordination with the operations. The operator's costs for business interruption, slow-down, and coordination with the remediation contractor are also "short- and long-term costs of the actions" which the DEQ has not considered but which make the most expensive alternative even more expensive. This preferred remedy is the most expensive alternative, does not include all costs, and does not meet the statutory criteria of cost-effectiveness.

A 1995 amendment to the statute dictates how cost-effectiveness is determined. It states:

> 75-10-721(5) For purposes of this section, cost-effectiveness must be determined through an analysis for incremental costs and incremental risk reduction and other benefits of alternatives considered, taking into account the total anticipated short-

term and long-term costs of remedial action alternatives considered, including the total anticipated cost of operation and maintenance activities.

The preferred remedy also fails this statutory standard of cost-effectiveness because while the DEQ identifies this as the most expensive remedy, the remedy does not achieve any risk reduction. The bottom line is that there is no net risk-reduction to be gained as a result of the proposed large expenditure.

Response 85: Primary among CECRA's mandates is the requirement that the remedy "must attain a degree of cleanup of the hazardous or deleterious substance and control of a threatened release or further release of that substance that assures present and future protection of public health, safety, and welfare and of the environment." Section 75-10-721(1), MCA (1993). DEQ "shall require cleanup consistent with applicable state or federal environmental requirements, criteria or limitations" and "shall consider and may require cleanup consistent with substantive state or federal environmental requirements, criteria, or limitations that are well suited to the site conditions." Section 75-10-721(2), MCA (1993).

In addition, § 75-10-721(2)(c), MCA (1993) states that DEQ shall select remedial actions that, at a minimum, protect public health, safety, and welfare and the environment and that: (i) use permanent solutions (ii) use alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (iii) are cost-effective, taking into account the total short- and long-term costs of the actions, including the cost of operations and maintenance activities for the entire period during which the activities will be required. However, the requirements set forth in § 75-10-721(2)(c), MCA (1993), do not modify the mandatory application of applicable and well-suited requirements of § 75-10-721(2)(a)(b), MCA (1993).

The referenced amendment to § 75-10-721, MCA, is inapplicable to the Livingston due to the applicability of the 1995 legislative savings clause. The 1991 CECRA language, in contrast to the 1995 CECRA language, reflects the cost-effectiveness language contained in CERCLA. Even assuming that the 1995 amendments did apply to this facility, the selected remedy still meets the cost-effectiveness definition.

The cost-effectiveness of the selected remedy is set forth in the Statutory Determinations section of the ROD. The selected remedy was not, as the commenter states, necessarily the most expensive alternative evaluated if assumptions consistently applied for each alternative are considered. However, because the proposed plan is the public's opportunity to evaluate the alternatives and proposed remedy, DEQ included costs which would most certainly be applicable to other alternatives. For instance, diesel fuel monitoring would be included for all alternatives, except for the no action alternative. In addition, the additional costs cited by the commenter would be applicable to alternatives C and D. However, Phase I well locations have been placed to cause as little disruption to on-going operations as necessary while still recovering free product from what is viewed as the thickest part of the plume. Please refer to Response #3 regarding ongoing operations, including health and safety issues.

The estimated cost of the selected remedy is $2,229,028. To a large extent, the remedy relies on natural attenuation after initial source removal rather than pump and treat technologies. In

addition, asbestos waste is capped rather than removed and the diesel recovery is being implemented in a phased approach, building on knowledge gained in the previous phase. Each of these offers a cost-effective alternative as the selected remedy while still assuring protection of public health, safety, and welfare and the environment as well as compliance with applicable state or federal ERCLs and substantive state or federal ERCLs that are well suited to site conditions. Source removal, although causing greater short-term costs, significantly reduces long-term costs and also allows the remedy to avoid pump and treat technologies. Short-term costs due to safety concerns provide added protection in proportion to its costs. Some of the costs referenced by the commenter, such as spotter costs, were included in the cost estimates. The additional cost of long-term monitoring is reasonably related to the greater overall effectiveness of the selected remedy.

Comment 86: Removal of free product to the "maximum extent practicable" is inconsistent with the Consent Decree which requires actions which are "reasonably designed to protect the public health, welfare, and the environment."

The 1990 Partial Consent Decree, Order and Judgment between the State of Montana and BN ("Consent Decree") governs the selection of a remedy for the Livingston Shop Complex. The Consent Decree identified BN's obligations as "the performance . . . of actions which are reasonably designed to protect the public health, welfare, and environment at or from the Livingston . . . facilities." (Consent Decree, 10.) Because free product migration has already been abated through the implementation of interim actions and there are no present human health concerns associated with the free product the preferred remedy for free-product is unreasonable and not designed to protect the public health, welfare, and the environment.

Response 86: The Consent Decree language cited by the commenter is an obligation placed on BNSF rather than DEQ. Nevertheless, the consent decree requires DEQ to select the proper remedy for the Burlington Northern Livingston Complex through a ROD process, drawing upon CERCLA and NCP for guidance or as otherwise appropriate and upon consideration of the remedial investigation report and feasibility study report at the Facility.

For remedy selection under CECRA, § 75-10-721(2)(c), MCA (1993) states that DEQ "shall select remedial actions that, at a minimum, protect public health, safety, and welfare and the environment." Please refer to Response #61 regarding the risk posed by petroleum contamination in soils and groundwater. In addition, the statute requires protection of public health, safety, *and* welfare *and* the environment *and* compliance with ERCLs.

Extensive free product remains. As set forth in the ERCLs, attached as Attachment A, several ERCLs require the removal of the free product to the maximum extent practicable. First, under the underground storage tank ERCLs, owners and operators must remove free product to the maximum extent practicable as determined by the implementing agency. In addition, the state's groundwater resource is addressed under the water quality ERCLs which prohibits the causing of pollution of any state waters. Leaving the source contributes to exceedances of water quality standards and fails to allow its beneficial uses. In addition, water quality ERCLs make it unlawful to place or cause to be placed any wastes where they will cause pollution of any state waters. Only removal of the free product to the cleanup level will allow for protection of the

groundwater resource. In addition, removal of free product will comply with nondegradation laws by assuring there will not be plume expansion.

5.0 RESPONSES TO WRITTEN COMMENTS RECEIVED AFTER THE COMMENT PERIOD

5.1 Comments from Washington Corporations

Comment 87: This letter is written to inform you of factual errors contained in the Site Background section of the Proposed Plan for the Burlington Northern Santa Fe Livingston Shop Complex and to request that corrections be made to the record. The first paragraph of the Site Background section contains the following sentence, on page 4: "In 1987 Washington Corporation(sic) of Missoula, Montana purchased the complex and operated the Livingston Rebuild Center (LRC) and Montana Rail Link (MRL) at the site." With regard to that sentence please be advised of the following:

1) Washington Corporations never purchased the Livingston Shop Complex;
2) Washington Corporations has never owned the Livingston Shop Complex;
3) Washington Corporations has never operated the Livingston Rebuild Center; and
4) Washington Corporations has never operated Montana Rail Link.

Response 87: Comment noted. Montana Rail Link (MRL) purchased the buildings within the Livingston complex from BNSF in 1987 and began operation of MRL at the site. A group of shareholders owned and operated the Livingston Rebuild Center (LRC) until its sale in 2000 to Talgo-LRC, LLC and the USA Northwest, Inc. The Talgo-LRC company rebuilds locomotives and railroad cars and MRL performs locomotive repairs and maintenance. Both MRL and Talgo-LRC continue to operate at the site.

APPENDIX C

Asbestos Sample Results

DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES

OCCUPATIONAL HEALTH BUREAU

STAN STEPHENS, GOVERNOR

COGSWELL BUILDING

STATE OF MONTANA

FAX # (406) 444-2606
TELEPHONE (406) 444-3671

HELENA, MONTANA 59620

November 1, 1990

John Wadhams
Solid & Hazardous Waste Bureau
Montana Department of Health
Helena, MT 59620

Dear John:

This letter contains the report of the examination of the bulk samples you submitted for asbestos analysis.

These samples were examined by polarized light microscopy utilizing dispersion staining techniques.

The results of these analyses are listed below:

BN RAIL YARD SITE 11/01/90

DESCRIPTION	RESULT
White-thick paper material	contains chrysotile asbestos
Grey-black coarse woven material	contains chrysotile asbestos
Grey-black rope	contains chrysotile asbestos

Sincerely,

William A. Hooper
Industrial Hygienist

WAH:bm

APPENDIX D

PAH Surficial Soil Cleanup Level Spreadsheets

COMMERCIAL SCENARIO
CARCINOGENS

Cancer Risk Formula

Cs = {[TR*BW*AT] / [EF*ED*((SFo*CF*IRSa)+(SFo*IRAa*[1/PEF])+(SFo*CF*ABS*DFa))]}

BENZO(A)PYRENE	
Parameters	Values
Cs (Soil concentration - mg/kg)	3.8
TR (Target cancer risk, DEQ)	1.0E-05
BW (Adult body weight - kg; EPA, August 1997 & CDM, May 1993)	70
AT (Averaging time - day; EPA, December 1991 & CDM, May 1993)	25550
EF (Exposure frequency - day/yr, CDM, May 1993)	187
ED (Exposure duration - yr; CDM, May 1993)	30
SFo (Chemical specific oral cancer slope factor - kg-day/mg; IRIS, August 2001)	7.30E+00
CF (Conversion factor - kg/mg; EPA, December 1991)	1.0E-06
IRSa (Adult soil ingestion rate - mg soil/day; EPA, Dec.1991 & CDM, May 1993)	100
IRAa (Adult inhalation rate - m^3/day; EPA, Aug. 1997 & CDM, May 1993)	20
1/PEF (Particulate emission factor - m^3/kg; EPA, May 1996)	1.36E+09
ABS (Dermal absorption rate - unitless; EPA, Dec. 1995 & EPA, March 1999)	0.13
DFa (Adult dermal factor - mg/day; EPA, August 1997)	120.9

BENZO(B)FLUORANTHENE	
Parameters	Values
Toxicity equivalence to benzo(a)pyrene (EPA, March 1993)	0.1

BENZO(K)FLUORANTHENE	
Parameters	Values
Toxicity equivalence to benzo(a)pyrene (EPA, March 1993)	0.01

DIBENZO(A,H)ANTHRACENE	
Parameters	Values
Toxicity equivalence to benzo(a)pyrene (EPA, March 1993)	1

CHRYSENE	
Parameters	Values
Toxicity equivalence to benzo(a)pyrene (EPA, March 1993)	0.001

INDENO(1,2,3-CD)PYRENE	
Parameters	Values
Toxicity equivalence to benzo(a)pyrene (EPA, March 1993)	0.1

CDM, May 1993 Final Report Baseline Risk Assessment Livingston Rail Yard

EPA, March 1999. Risk Assessment Guidance for Superfund Volum 1. Human Helath Evaluation Manual Supplemental Guidance Dermal Risk Assessment Interim Guidance.

EPA Region III, October 1998. Risk-Based Concentration Table.

EPA, August 1997. Exposure Factors Handbook Volume I General Factors

EPA, May 1996 Soil Screening Guidance. Technical Background Document.

EPA, March 1993. Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons.

EPA, December 1991. Risk Assessment Guidance for Superfund: Volume I Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals)

EPA, December 1991. Risk Assessment Guidance for Superfund: Volume I Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals).

EPA Region III, December 1995. Assessing Dermal Exposure from Soil.

IRIS, August 2003. EPA's Integrated Risk Information System.

Age-adjusted Factors

Soil Ingestion Factor (EPA, December 1991)

IFSadj = EDc*IRSc/BWc + (EDtot-EDc)*IRSa/BWa

Parameters	Values
IFSadj (Age-adjusted soil ingestion factor - mg*yr/kg*day: EPAIII, October 1998)	114.29
EDc (Child exposure duration - yr; EPA, December 1991)	6
IRSc (Child soil ingestion rate - mg/day; EPA, August 1997)	200
BWc (Child body weight - kg; EPA, August 1997)	15
EDtot (Total exposure duration - yr; EPA, December 1991)	30
IRSa (Adult soil ingestion rate - mg/day; EPA, August 1997)	100
BWa (Adult body weight - kg; EPA, August 1997)	70

Air Inhalation Factor

IFAadj = EDc*IRAc/BWc + (EDtot-EDc)*IRAa/BWa

Parameters	Values
IFAadj (Age-adjusted inhalation factor - m^3*yr/kg*day: EPAIII, October 1998)	11.66
EDc (Child exposure duration - yr; EPA, December 1991)	6
IRAc (Child inhalation rate - m^3/day; EPA, August 1997)	12
BWc (Child body weight - kg; EPA, August 1997)	15
EDtot (Total exposure duration - yr; EPA, December 1991)	30
IRAa (Adult inhalation rate - m^3/day; EPA, August 1997)	20
BWa (Adult body weight - kg; EPA, August 1997)	70

Dermal Factor

DFadj = EDc*DFc/BWc + (EDtot-EDc)*DFa/BWa

Parameters	Values
DFadj (Age-adjusted dermal factor - mg*yr/kg*day: EPAIII, October 1998)	80.32
EDc (Child exposure duration - yr; EPA, December 1991)	6
DFc (Child dermal factor - mg/day; EPA, August 1997)	97.17
BWc (Child body weight - kg; EPA, August 1997)	15
EDtot (Total exposure duration - yr; EPA, December 1991)	30
DFa (Adult dermal factor - mg/day; EPA, August 1997)	120.9
BWa (Adult body weight - kg; EPA, August 1997)	70

Dermal Factor Adult (Groundskeeper 5 Adherence)

DFa = SAah*AFah + SAaa*AFaa + SAaf*AFaf

Parameters	Values
DFa (Adult dermal factor - mg/day; EPA, August 1997)	120.90
SAah (Adult hand surface area - cm^2; EPA, August 1997)	1170
AFah (Adult hand adherence factor - mg/cm^2*day; EPA, August 1997)	0.032
SAaa (Adult arm surface area - cm^2; EPA, August 1997)	3580
AFaa (Adult arm adherence factor - mg/cm^2*day; EPA, August 1997)	0.022
SAaf (Adult face surface area - cm^2; EPA, August 1997)	1430
AFaf (Adult face adherence factor - mg/cm^2*day; EPA, August 1997)	0.0039

Child Surface Areas

SAc = SAct/SAat*SAa

Parameters	Values
SAch (Child hand surface area - cm^2; EPA, August 1997)	388
SAct (Child total surface area - cm^2; EPA, August 1997)	7620
SAat (Adult total surface area - cm^2; EPA, August 1997)	23000
SAah (Adult hand surface area - cm^2; EPA, August 1997)	1170
SAca (Child arm surface area - cm^2; EPA, August 1997)	1173
SAaa (Adult arm surface area - cm^2; EPA, August 1997)	3580
SAcf (Child face surface area - cm^2; EPA, August 1997)	474
SAaf (Adult face surface area - cm^2; EPA, August 1997)	1430

Dermal Factor Child (Daycare Kid 1h Adherence)

DFc = SAch*AFch + SAca*AFca + SAcf*AFcf

Parameters	Values
DFc (Child dermal factor - mg/day; EPA, August 1997)	97.17
SAch (Child hand surface area - cm^2; EPA, August 1997)	388
AFch (Child hand adherence factor - mg/cm^2*day; EPA, August 1997)	0.15
SAca (Child arm surface area - cm^2; EPA, August 1997)	1173
AFca (Child arm adherence factor - mg/cm^2*day; EPA, August 1997)	0.031
SAcf (Child face surface area - cm^2; EPA, August 1997)	474
AFcf (Child face adherence factor - mg/cm^2*day; EPA, August 1997)	0.0055